REPUBLIC OF SOUTH AFRICA

ANNUAL REPORT

of the

Secretary for Agricultural Technical Services for the period 1 July, 1972 to 30 June, 1973

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Report of the Secretary for Agricultural Technical Services for the period 1st July, 1972, to 30th June, 1972

THE HONOURABLE THE MINISTER OF AGRICULTURE,
PRETORIA.

Sir,

I have the honour to submit herewith the Annual Report of the Department.

W.A. VERBEEK
Secretary for Agricultural Technical Services

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COVER

The new head office building of the Botanical Research Institute in the Pretoria National Botanical Garden

1. Introduction

A PROGRAMME FOR AGRICULTURAL DEVELOPMENT IN SOUTH AFRICA

When factors such as the growing population of the Republic and its relatively low agricultural potential are considered, together with the limited and steadily skrinking area of good arable land, the vulnerability of agricultural resources, often unadapted or ill-adapted farming systems and ruinous managerial practices, there can be no doubt about the precarious situation in which the South African agricultural industry finds itself in supplying food for the nation.

Obviously, therefore, the agricultural industry will have to be guided in its development by carefully directed planning.

The Department of Agricultural Technical Services has assumed responsibility for planned agricultural development, and it was with a view to effective planning that the policy of agricultural development in accordance with the principles of optimal land use was laid down in 1970. This policy is considered to be a sound basis for planned agricultural development, both for the present and for the future.

The principle of optimal land use means that agricultural production:

- Should be conducted in harmony with the natural environmental factors
- Should not take place at the expense of agricultural resources
- Should be founded on economic principles.

The Department is to an increasing extent engaging in systematically planning the development of the agricultural industry on these lines and promoting the implementation of these principles.

The establishment of an agricultural industry which will develop in accordance with the principles of optimal land use is an ideal that cannot be achieved overnight. The realisation of this ideal depends chiefly on the human potential that has to put these principles into practice. It is therefore of the utmost importance that planned development should take account of this overriding factor.

Since the environmental factors are so important in the planning and implementation of sound agricultural development, the research needed to fill the gaps in our limited knowledge of our agricultural resources is regarded as a high priority.

Although working towards implementation of the principles of optimal land use is a continuous and long process, it is fortunately a process that can be started at any time and at any place. The process of development can be made to fit in with the present level of development and knowledge in a particular area or industry. It is therefore possible to promote the process on a planned, country-wide basis.

The Department is at present giving high priority to the planning of a sound process of agricultural development. All the Department's branches are involved in this process of development, and to make it a meaningful process all the energies, skills and information at the disposal of the Department's eleven institutes, eight regional organisations and five divisions have to be welded into a whole.

With a view to co-ordinating the various bodies within the Department in a concerted drive to promote agricultural development according to the principles of optimal land use, all these bodies recently drew up development programmes. These development programmes enable the Department to make a critical analysis of the aims and functions of the regional organisations, institutes and divisions against the background of the combined effort.

These development programmes have made it possible to define aims and functions more clearly and to initiate or continue the essential planning tasks.

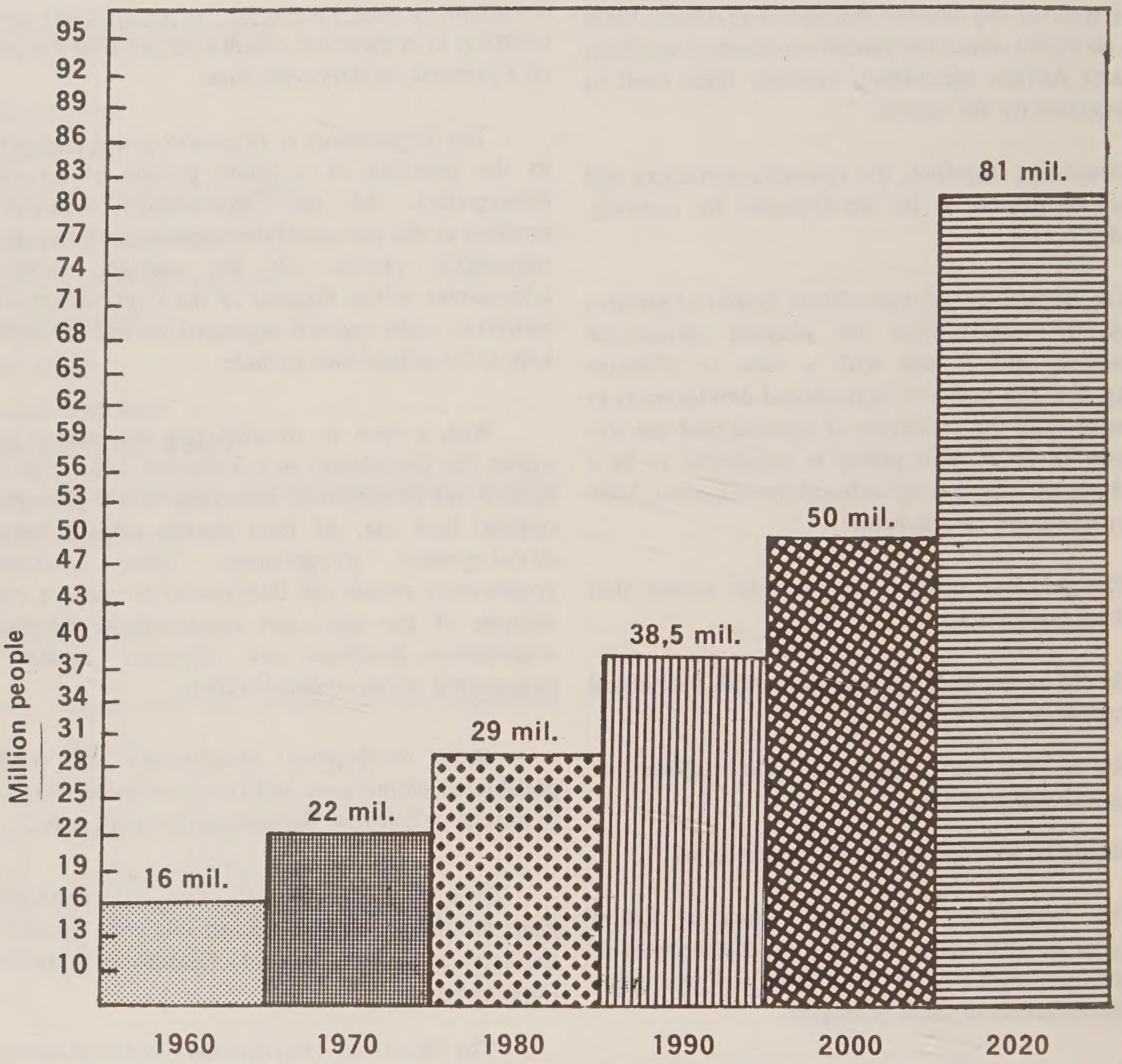
It is imperative that these separate development plans should be co-ordinated into one great totality, and this is at present the subject of intensive study in the Department.

The Department has decided that the planning and promotion of agricultural development in accordance with the desired principles can best be effected on a regional or area basis. It follows, then, that the business of marshalling the knowledge and energies of the various bodies under the Department is also seen as something which has to be tackled on this basis.

With a view to furthering agricultural development on a regional or area basis in accordance with the principles of optimal land use, the specific steps that have to be taken were identified. Carrying these steps to a conclusion will ensure the involvement of all bodies and services that can make a contribution at any given time or place.

1. *The demarcation of fairly homogeneous farming areas* is regarded as a fundamental step in the planned development of the agricultural industry. In the first place this serves to divide the country's agricultural potential into significant components. This process makes it possible to get a better idea of the agricultural potential on a national as well as a local level and therefore to arrive at a more complete overall inventory of our agricultural resources. Gaining a better idea of the agricultural potential of the various areas over the length and breadth of the country through demarcation into fairly homogeneous farming areas is seen as the first step towards effective planning.

Through the development programmes of the various regional organisations the process of demarcation has already begun to take shape. This preliminary



Source:

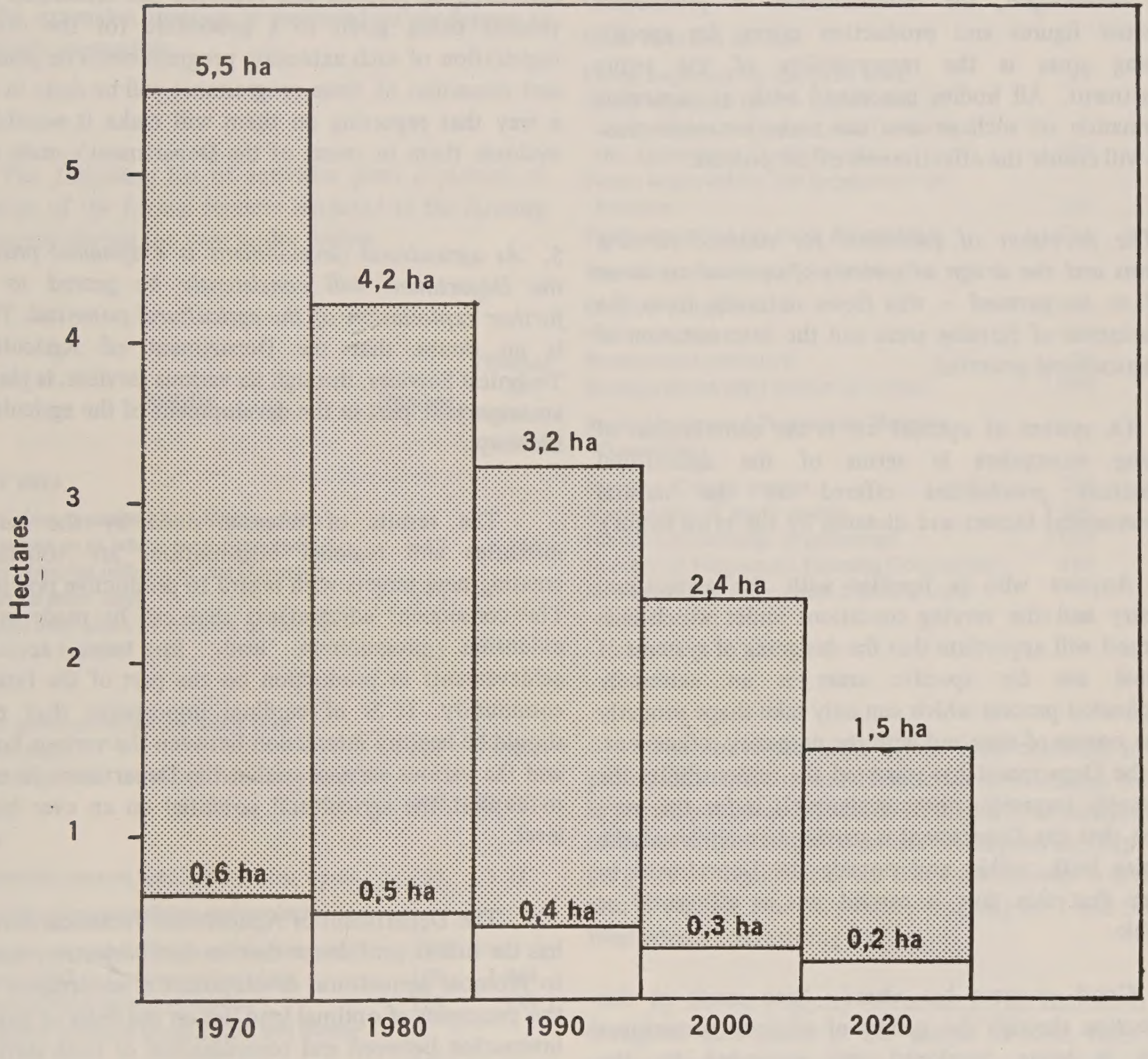
* Abstract (1973)

* Sadie (IDC)

This histogram represents the anticipated growth of the total population up to the year 2020. It is predicted that towards the end of the century the population will have much more than doubled demarcation is effective enough to enable the planning process to proceed. In time the preliminary demarcation will be refined in the light of new knowledge of the soil, climate and vegetation.

The collection of data with a view to refining the demarcation of farming areas is enjoying priority. Although the basic data will be provided by the Botanical and the Soil and Irrigation Research Institutes, all the agencies that are able to make a contribution, that is, all regional organisations, institutes and divisions, are involved.

2. *The determination of production potential* inevitably goes hand in hand with, or is an offshoot of, the demarcation process. The value of each farming area



Source

★ Abstract (1973)

★ Sadie (IDC)

The area of the Republic is 122 million hectares which means that in 1970 only 5,5 hectare was available per person (of the total population) and 0,6 hectare cultivated soil per person. In about 2020 only a meagre 1,5 hectare will be available for every South African and only 0,2 hectare cultivated soil per person

has to be appraised with regard to its production potential, in the light of the principles of optimal land use.

The production norms and requirements that have to be complied with in order to utilise the production potential also have to be laid down. The determination of production potential and production norms serves as an immediate point of contact or guideline for research to find solutions to the problems of exploiting the production potential. On the other hand, potential and production norms serve as a direct basis for the exploitation of the production potential.

Here again, the determination of production potential figures and production norms for specific farming areas is the responsibility of the entire Department. All bodies concerned with or possessing information on such an area can make a contribution. This will ensure the effectiveness of the process.

3. *The provision of guidelines for adapted farming systems and the design of systems of optimal use as an ideal to be pursued* – this flows naturally from the demarcation of farming areas and the determination of the agricultural potential.

(A system of optimal use is the combination of farming enterprises in terms of the agricultural production possibilities offered by the natural environmental factors and dictated by the price factor).

Anyone who is familiar with the agricultural industry and the varying conditions under which it is practised will appreciate that the designing of systems of optimal use for specific areas is an extremely complicated process which can only take shape properly in the course of time and with the necessary refinement. But the Department has accepted the responsibility for constantly improving these systems. It is for this very reason that the Department is striving to mobilise all the energies both within and outside the Department to ensure that this task is carried out as efficiently as possible.

Good progress has already been made in this connection through the system of advisory committees which is being developed and expanded by the Department. Such committees, which consist of experts from the Department and representatives of interested agricultural and industrial organisations, have been functioning for some time, helping to provide guidance for research programmes over virtually the entire spectrum of the various production enterprises and to determine priorities for such programmes.

The Department intends to evaluate progress on the basis of the norms that will be laid down from time to time.

4. *To determine the systems of optimal use and provide the guidelines* which may be decided upon from time to time in this connection will have little value if these systems and guidelines cannot be put into practice in farming. In order to speed up the acceptance and application of knowledge it is necessary to approach the farmer in his own socio-cultural setting, because acceptance and application are not dictated by scientific considerations alone.

That is why it is essential to ensure that carefully considered and well-planned extension programmes will be implemented. It is the policy of the Department that extension programmes, like scientific research work, are registered as projects and reported on. Attention is at present being given to a procedure for the orderly registration of such extension programmes. The planning and execution of these programmes will be done in such a way that reporting on them will make it possible to evaluate them in terms of the Department's main task.

5. *As agricultural development is a dynamic process, the Department will consistently be geared to the further exploitation of the agricultural potential.* There is no doubt that the Department of Agricultural Technical Services, through its various services, is playing an important part in the development of the agricultural industry.

The results of research done by the various institutes and regional organisations are constantly creating new targets with regard to productive potential. The consequent adjustments that can be made in the extension programmes lead, in turn, to new achievements in production on the part of the farming community. It is of cardinal importance that there should be healthy interaction between the various bodies and the various services within the Department in order to exploit the agricultural potential on an ever higher level.

The Department of Agricultural Technical Services has the fullest confidence that its chief objective, namely to promote agricultural development in accordance with the principles of optimal land use on the basis of healthy interaction between and co-ordination of both staff and knowledge within the Department, will be realised in the interests of South Africa's agricultural industry.

This report already reflects the initial phase of the Department's drive to carry the policy of optimal land use into effect in South African agriculture as quickly and effectively as possible. On the one hand the report gives a picture of the progress that has been made and on the other hand it highlights problems that underscore the necessity for a national agricultural development programme, such as the one outlined here.

2. Extension and Education

AGRICULTURAL EXTENSION

The function of the Extension Service is not only to impart to farmers the latest agricultural knowledge, skills and techniques, and to foster desirable attitudes and aspirations among them, but also to ensure that the farmers accept these things and put them into practice.

Modern educational techniques are used to ensure that the extension message is conveyed to the farmer as effectively as possible.

The following list of activities gives a picture of the range of the formal services rendered to the farming community during the year under review:

Activity	Number	Number of farmers reached
Farmers' days		
Farmers' days organised by officers of the Department or in which they participated	447	3 245
Lectures given by officers of the Department at farmers' days	672	
Demonstrations given by officers of the Department at farmers' days	123	
Lectures		
Lectures given on occasions other than farmers' days	1 651	35 989
Number of lectures for which visual aids were used	952	22 581
Courses		
Departmental courses held in extension wards	153	3 217
Co-operative demonstrations and projects		
Co-operative demonstrations in progress	298	
Gatherings held at demonstration plots	169	1 944
Other agricultural demonstrations	129	984
Co-operative research projects laid out during the year	116	
Total number of co-operative research projects in progress	170	
Farm visits and interviews with farmers		
Farm visits by officers of the Department	77 507	77 507
Follow-up visits in connection with farm planning	12 133	12 133
Personal interviews in extension offices	81 150	81 150
Other personal interviews	22 497	22 497
Telephone interviews	112 074	112 074
Correspondence		
Personal letters dispatched	19 751	19 751
Circulars dispatched	977	153 673
Shows		
Shows held in various extension wards	168	
Officers who acted as judges or supervisors	237	
Exhibitions organised by officers of the Department at shows or other functions	13	
Farming competitions		
Farming competitions held in extension wards at which officers of the Department adjudicated	109	
Competitors	746	
Other statutory services		
Farms inspected for the Land Bank	49	
Farms inspected for the Department of Agricultural Credit and Land Tenure and the Agricultural Credit Board	1 233	
Farms inspected for the Department of Planning	306	
Farms inspected for other departments	535	
Inspections in terms of the Weeds Act		
Properties inspected	13 416	
Notices served	973	
Prosecutions instituted	22	
Re-inspections after service of notices	1 948	
Study Groups and Programme Planning Committees		
Number of study groups	283	
Membership of study groups	3 305	
Number of meetings or gatherings	1 049	
Number of Programme Planning Committees	148	
Membership of Programme Planning Committees	1 480	

The above are some of the chief activities of the professional officers and technicians in extension offices in the Republic and South West Africa. The distribution of these offices is shown on the accompanying map. For purposes of organisation the Extension Service is divided into 8 regions (the Republic consisting of 7 and South West Africa constituting 1).

By far the majority of contacts with farmers in the 8 regions take place in the course of farm visits and personal interviews at office.

New trends

One of the fundamental extension tasks is to identify shortcomings in the farming enterprise and offer solutions. In performing this task the Department carries out surveys studies and practical studies on individual farms.

Intensive practical studies, particularly on perennial crops, are increasingly applied in the *Winter*

Rainfall Region, and this type of research is being extended to studies on wine grapes in the Stellenbosch District, apples at Ceres and table grapes in the Hex River Valley.

As regards the collection of information, extension activities in the *Natal Region* are based on a regional master programme, with supporting programmes at the ward level.

In the *Highveld Region* extension programmes are being directed increasingly at assessment of soil potential and the differences in the potentials of various soils. The result is that the farming community is becoming increasingly interested in classifying and exploiting soils according to their differences in potential.

In the *Karoo Region* the trend among extension officers is to make increasing use of group extension, owing to the large numer of people who can be reached by this method. For instance, groups of farmers are involved in one-day courses in the subcatchments of the Verwoerd Dam, to familiarise them with the utilisation of land and veld according to inherent differences in potential.

The *Transvaal Region* has been organising all extension activities according to a network programme for agricultural development. In accordance with this programme specific target areas are defined, the agricultural potential is determined and farming systems are formulated which are then disseminated to the farmers in the target area, by means of the extension programme.

On the production level the rise in wool prices has largely restored confidence in the future of wool. Consequently the *Eastern Cape Region's* office finds that farmers are realising anew that indiscriminate cross-breeding is wrong. The use of Merino rams exclusively for breeding in Merino flocks is increasing among farmers who used to follow other breeding practices.

Progress with programme planning

The stage has already been reached where programme planning as a working method is practised in all the extension wards. At present there are about 148 formal planning committees, with a membership of 1 480 farmers. In certain extension wards the soil conservation committees function as the planning committees, particularly in the matter of organising programmes in connection with conservation.

As regards progress with extension programmes, the following may be mentioned:

In the *Winter Rainfall Region* 48 extension programmes are under way, 16 of which are directed at production aspects and 32 at conservation aspects.

1. In the Swartland subregion the influence of extension programmes has been such that the contours surveyed during the year under review amount to 78 per cent of the combined length of contours in the subregion as a whole.
2. The collection of census data (phase 1) on 600 farms in the Upper Berg River Project having been completed, phase 2, i.e. intensive practical studies, was started during the year under review. On the basis of this information it will be possible to provide more effective extension for the farming community in the near future.
3. The programme target of a previous year, viz to recruit more Turkish tobacco producers, having been achieved, the focus of this programme shifted to increasing the crop by 150 000 kg and improving its quality. Here, too, the programme was most successful, because the total yield of the group of farmers was increased by 275 000 kg (from 700 000 kg to 975 000 kg), with a minimum of unmarketable green tobacco – in contrast with the previous year, when 105 000 kg of tobacco out of a total crop of 275 000 kg was unmarketable. This has been a case where spectacular success has been achieved with programme planning.

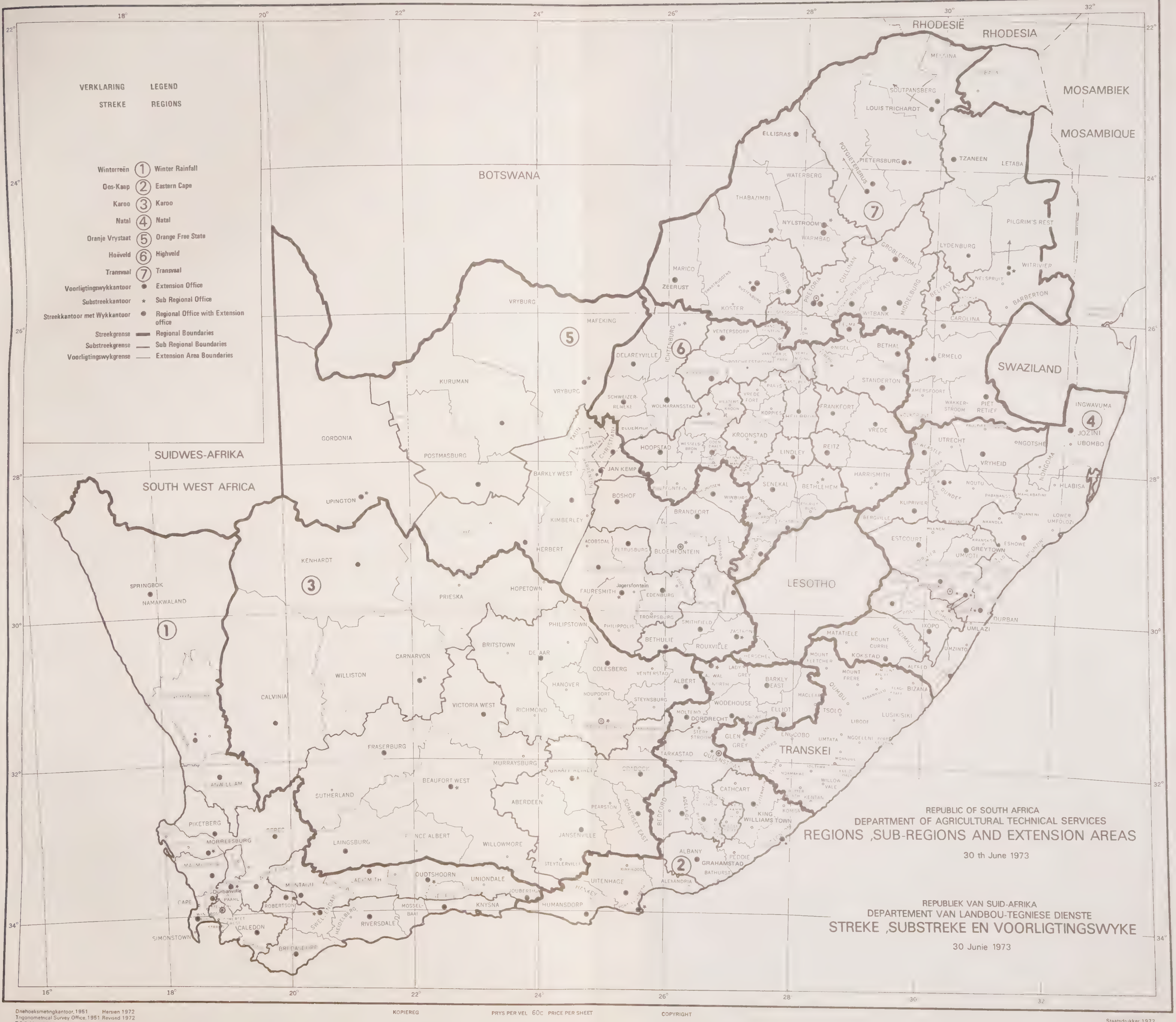
In the *Eastern Cape Region* great strides have been made with programme planning through the registration of key programmes and liaison projects. Liaison projects are supplementary to broader key programme. Four key programmes have already been registered, viz Veld Improvement and Utilisation, Protection of Cultivated Land Against Erosion, Community Development, and Catchment Area Planning.

A good example of a programme of this type and of the progress that has been made is the extension programme in the Aliwal North extension ward.

The purpose of this programme is to protect cultivated land in the districts of Aliwal North, Lady Grey and Jamestown against wind and water erosion by the provision of contours and/or stormwater channels on all fields with a slope of more than 2 per cent, to improve accordingly existing contours not built to specification, and to maintain existing contours by applying the correct methods of tillage.

This programme was started in July 1967.

The following table gives an indication of the


VERKLARING LEGEND
STREKE REGIONS
Winterreën ① Winter Rainfall
Oos-Kaap ② Eastern Cape
Karoo ③ Karoo
Natal ④ Natal
Oranje Vrystaat ⑤ Orange Free State
Hoëveld ⑥ Highveld
Transvaal ⑦ Transvaal
Voorligtingswykkantoor ● Extension Office
Substreekkantoor ★ Sub Regional Office
Streekkantoor met Wykkantoor ● Regional Office with Extension office
Streekgrense ▬ Regional Boundaries
Substreekgrense — Sub Regional Boundaries
Voorligtingswykgrense — Extension Area Boundaries
18°
20°
22°
24°
26°
28°
30°
32°
16°
34°
RHODESIË
RHODESIA
MOSAMBIEK
MOSAMBIQUE
BOTSWANA
SUIDWES-AFRIKA
SOUTH WEST AFRICA
SWAZILAND
LESOTHO
TRANSKEI
MESSINA
SOUTPANSBERG
LOUIS TRICHARDT
ELLISRAS
PIETERSBURG
TZANEEN
LETABA
POTGIETERSRUS
WATERBERG
THABAZIMBI
NYLSTROOM
WARMBAD
PILGRIM'S REST
LYDENBURG
GROBLERSDAL
CULLINAN
WITRIVIER
NELSPRUIT
BARBERTON
MARICO
ZEERUST
BRITS
PRETORIA
KOSTER
WITBANK
MIDDELBURG
BELFAST
CAROLINA
VRYBURG
MAFEKING
VENTERSDORP
DELAREYVILLE
LICHTENBURG
POTCHEFSTROOM
NIGEL
BETHAL
ERMELO
STANDERTON
SCHWEIZER-RENEKE
WOLMARANSSTAD
PARYS
VREDEFORT
KROONSTAD
FRANKFORT
AMERSFOORT
WAKKERSTROOM
PIET RETIEF
INGWAVUMA
JOZINI
UBOMBO
KURUMAN
GORDONIA
POSTMASBURG
BARKLY WEST
TAUNG
HARTSWATER
CHRISTIANA
BLOEMHOF
HOOPSTAD
JAN KEMP
LINDLEY
REITZ
VREDE
UTRECHT
VRYHEID
NGOTSHE
NONGOMA
HLABISA
UPINGTON
KIMBERLEY
BOSHOF
BRANDFORT
WINBURG
SENEKAL
BETHLEHEM
HARRISMITH
DUNDEE
NQUTU
MAHLABATINI
KLIPRIVIER
BERGVILLE
ESTCOURT
ESHOWE
LOWER UMFOLOZI
GREYTOWN
UMVOTI
HERBERT
KENHARDT
ACOBSDAL
PETRUSBURG
BLOEMFONTEIN
PRIESKA
HOPETOWN
SPRINGBOK
NAMAKWALAND
FAURESMITH
Jagersfontein
EDENBURG
TROMPSBURG
SMITHFIELD
PHILIPPOLIS
PHILIPSTOWN
BETHULIE
ROUXVILLE
ZASTRON
IXOPO
DURBAN
UMLAZI
UMZINTO
BRITSTOWN
DE AAR
MATATIELE
MOUNT CURRIE
KOKSTAD
ALFRED
CARNARVON
WILLISTON
COLESBERG
VENTERSTAD
ALBERT
LADY GREY
ALIWAL NORTH
BARKLY EAST
MOUNT FLETCHER
MOUNT FRERE
BIZANA
LUSIKISIKI
HANOVER
NOUPOORT
STEYNSBURG
WODEHOUSE
ELLIOT
MACLEAR
TSOLO
CALVINIA
VICTORIA WEST
RICHMOND
MOLTENO
DORDRECHT
ENGCOBO
UMTATA
GLEN GREY
TARKASTAD
QUEENSTOWN
FRASERBURG
MURRAYSBURG
GRAAFF-REINET
CRADOCK
CATHCART
VAN RHYNSDORP
CLANWILLIAM
SUTHERLAND
BEAUFORT WEST
ABERDEEN
PEARSTON
SOMERSET EAST
BEDFORD
ADELAIDE
KING WILLIAMS TOWN
PIKETBERG
MOORREESBURG
CERES
LAINGSBURG
PRINCE ALBERT
WILLOWMORE
JANSENVILLE
MALMESBURY
STEYTLERVILLE
ALBANY
GRAHAMSTAD
PEDDIE
BATHURST
ALEXANDRIA
Durbanville
PAARL
CAPE
MONTAGU
LADISMITH
OUDTSHOORN
UNIONDALE
JOUBERTINA
UITENHAGE
ROBERTSON
SWELLENDAM
HEIDELBERG
MOSSELBAAI
KNYSNA
HUMANSDORP
CALEDON
RIVERSDALE
SIMONSTOWN
BREDASDORP
(1)
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REPUBLIC OF SOUTH AFRICA
DEPARTMENT OF AGRICULTURAL TECHNICAL SERVICES

REGIONS ,SUB-REGIONS AND EXTENSION AREAS

30 th June 1973

REPUBLIEK VAN SUID-AFRIKA
DEPARTEMENT VAN LANDBOU-TEGNIESE DIENSTE

STREKE ,SUBSTREKE EN VOORLIGTINGSWYKE

30 Junie 1973

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Trigonometrical Survey Office, 1951 Revised 1972
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KOPIEREG

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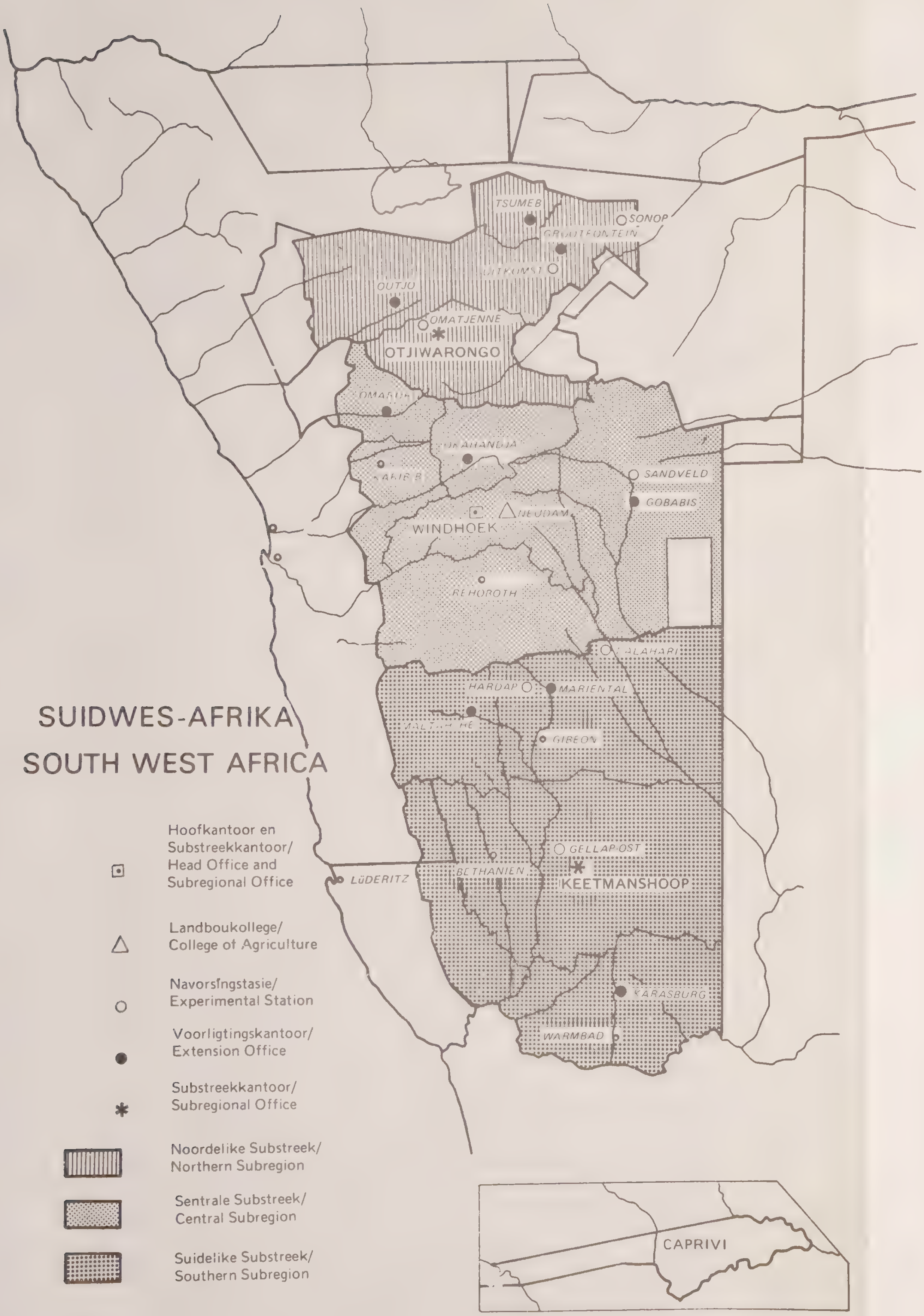
SUIDWES-AFRIKA
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TSUMEB
SONOP
GROOTFONTEIN
UITKOMST
OUTJO
OMATJENNE
OTJIWARONGO
OMARURU
OKAHANDJA
KARIBIB
WINDHOEK
NEUDAM
SANDVELD
GOBABIS
REHOBOTH
KALAHARI
HARDAP
MARIENTAL
MALTAHÖHE
GIBEON
GELLAP-OST
KEETMANSHOOP
BETHANIEN
LÜDERITZ
KARASBURG
WARMBAD
CAPRIVI
Hoofkantoor en Substreekkantoor/ Head Office and Subregional Office
Landboukollege/ College of Agriculture
Navorsingstasie/ Experimental Station
Voorligtingskantoor/ Extension Office
Substreekkantoor/ Subregional Office
Noordelike Substreek/ Northern Subregion
Sentrale Substreek/ Central Subregion
Suidelike Substreek/ Southern Subregion

progress made with the contouring of these fields:

Progress with the contour programme in the Aliwal North Extension Ward

Year	Hectares of land still requiring contours	Percentage of dryland area requiring contours
1967/68	10 363	24,3%
1968/69	7 561	18,2%
1969/70	5 996	14,4%
1970/71	4 032	9,5%
1971/72	3 105	7,3%
1972/73	2 395	5,7%

Two newsletters, one radio talk, 150 follow-up visits and 21 special visits by committee members, as well as four visits by officers of the Division of Soil Protection, were devoted to publicising this programme.

In the *Free State Region* programme planning is making good progress over a wide front. An example here is the extension programme for promoting swarthaak control in the Molopo soil conservation district.

The aim is to persuade all the participants in the programme to clear at least a further ten per cent of their farm area of swarthaak.

The 54 participants in the programme cleared 34 956 ha of farm land, which had been infested with swarthaak. The average area cleared by each participant was 647 ha, or 11 per cent. The short-term aim of this programme has therefore been achieved.

Many farmers who are not involved in this programme have also joined in the fight against swarthaak, which shows that this programme is having a ripple effect.

In the Mafeking extension ward a programme to promote the planting of *Cenchrus ciliaris* (buffalo grass) is under way.

The number of farmers who plant buffalo grass rose from 27 in 1971/72 to 54 – and the area under this pasture crop increased from 600 ha to over 1 500 ha during the past year.

In the *Highveld Region* 26 extension programmes are at present in operation. Aspects of farming such as pasture control, fertilising and maize cultivation, land classification, catchment planning, contouring and driftsand control are being promoted under one or more of these programmes.

The following successes can be reported:

In a maize-growing programme which was completed and finally evaluated during the year under review it appeared that the average maize yield in the area for the first 3 years of the programme was 1 450 kg per ha. During the last three years of the programme the yield rose to 2 298 kg per ha, which is an increase of over 60 per cent.

In an extension programme in the Delareyville extension ward aimed at gaining more knowledge about maize cultivation and fertilising, the knowledge of a group of 25 famrers increased by 34 per cent within 12 months – correct answers to factual questions put to them increased from 44 per cent to 78 per cent.

In the *Natal Region* extension work is done under the following broad headings: situation determinations, natural resources, economics, dairy production, beef production, crop farming and horticulture.

An evaluation of the progress made with banana cultivation by 60 farmers showed the following increases in yield:

Season	Yield (tons per ha)
1960/61	7,61
1966/67	10,97
1971/72	17,18

These results represent an increase in yield of almost 56 per cent since the 1966/67 season. Apart from this there are now 23 farmers who are making use of irrigation, as against only 3 in 1966/67.

Twelve extension programmes have already been launched in the *South West Africa Region*.

A recent evaluation showed that the programme have largely succeeded in persuading farmers to reduce their livestock numbers to within the prescribed carrying capacity.

In the *Karoo Region* attention was given chiefly to programmes on the following key subjects:

1. Evaluation of the Stock Reduction Scheme
2. Propagation of drought-resistant forage crops
3. Irrigation farming in the Fish River Valley
4. Catchment area planning

In the *Transvaal Region* 24 programmes, which were launched either in previous years or during the past year, are under way. A brief discussion of the results of two of these programmes follows.

In the Rustenburg extension ward the resting of veld and the planting of *Cenchrus ciliaris* (buffalo grass) by a group of 44 farmers was promoted by means of a programme. At present 26 out of 44 farmers rest their veld as against 7 farmers at the start of the programme. Only 3 farmers grew buffalo grass before, whereas now 23 farmers are planting it.

In the Brits extension ward programme was launched to increase wheat production. The specific targets of this programme were: increased application of nitrogen and improved irrigation techniques based on a bed method.

Participants in the programme were persuaded to apply almost 30 kg more nitrogen per ha than a control group of farmers. On an average these participants achieved an increase in yield of 10 bags per ha. During the same period the percentage of land irrigated by the bed method was raised from 0,9 per cent to 9 per cent. Participants who applied this method of irrigation obtained an increase in the yield of almost 8 bags per ha.

Generally speaking, programme planning enabled the agricultural extension officer to plan operations properly and to evaluate them scientifically. The successes mentioned above prove this.

Study groups

The study group is not only a very valuable extension medium, but also a great help to the extension officer when it comes to laying down production norms and testing recommendations in practice.

At present there are 283 study groups with a membership of 3 305, i.e. about 12 members per group. These groups held 1 049 meetings and other gatherings during the year under review.

Each of the study groups concerns itself with a wide variety of matters of real interest to them, such as wheat and maize yields, pasture management practices, and orchard and viticultural practices, depending on the farming area in which the group operates.

The following are two examples of what a study group can achieve:

In the Fauresmith extension ward the Philippolis- and Swaelstert mail-in records study groups improved their economic results as follows:

Philippolis Study Group	**1970/71** **(R)**	**1972/73** **(R)**
Gross farm income	12 267	16 254
Total farm expenditure	6 789	7 150
N.F.I.*	5 478	9 104
N.F.I. per R100 of capital investment	4,55	8,14
Swaelstert Study Group		
Gross farm income	18 259	36 414
Total farm expenditure	13 899	15 240
N.F.I.	4 359	21 174
N.F.I. per R100 of capital investment	1,67	8,58

*N.F.I. = Net farm income

The increase in the net farm income per R100 of capital invested can be ascribed chiefly to the better wool and meat prices, and also to a reduction in feed costs and the application of better management practices.

Conservation farming competitions

This form of farm competition continues to stimulate interest in conservation among farmers.

Sixty-two of these competitions were held during the year under review, and 353 farmers entered. Farmers' day were held on the farms of some of the winners and were attended by 922 farmers.

Extension research and surveys

Apart from surveys connected with individual extension programmes, the following specific surveys were either completed or the basic planning was completed.

1. A full-scale survey of onion production in the Caledon extension ward.
2. A survey of the water requirements of the drought-stricken Over-Hex-Nuy area of the Worcester-District.
3. A survey of the profitability of factory tomatoes in the Olifants River irrigation area.
4. A survey of the quality of irrigation water in the Montagu extension ward. (This is still in progress.)
5. A comprehensive survey of the ostrich industry. (It appears from this survey that ostrich numbers

have reached their highest level since 1930 and a revival in the industry is foreseen.)

6. Two situation determinations in the subcatchment areas of the Verwoerd Dam were completed and two surveys were started in the Fish River irrigation area.
7. Comprehensive surveys in connection with practical and production studies are being planned in the Free State Region.
8. Progress was made in the Highveld Region with the processing of mail-in record results. (It was found, *inter alia*, that sunflowers on soils of low potential in the central Highveld had a gross production value of R112,50 per ha, as against R72,97 per ha for maize grown on the same soil types.)
9. Yield studies with sunflowers were continued in the Highveld Region and were so successful that a sunflower yield calculator was designed and supplied to all extension offices in the Highveld Region.
10. A survey of 9 irrigation schemes in the Highveld Region was completed at the request of the Soil and Irrigation Research Institute. A short survey of the extent and possible adverse effects of game farming was also carried out in the extension wards in this Region.
11. An extensive survey of irrigation matters was completed in the White River area during the year under review.
12. In the Natal Region ten separate surveys, involving 877 farmers, were completed. Three of these surveys were launched to determine the farming situation in the Pietermaritzburg and Kokstad areas, and four related to maize farming in Northern Natal.

In-service training

In a dynamic industry such as agriculture in-service training for professional officers and technicians is essential.

The following in-service training courses were offered in the *Winter Rainfall Region* during the year under review:

Course	Number of field officers who attended
1. Soil classification	20
2. Veld pasture	21
3. Winter cereals	24
4. The identification of vine material	9
5. Cattle farming (Outeniqua)	5
6. Fruit and table grapes	10
7. Farm management	7
8. Supervision	6
9. Dairy farming	3

In the *Karoo Region* 14 extension officers and 9 technicians attended short courses in sheep and wool science.

In the *Free State Region* two seven-day courses in soil series classification were offered and attended by 110 professional officers and technicians as well as by the staff of the Faculty of Agriculture.

Three courses in land use planning were offered in the *Highveld Region*. The first two were 5-week courses

A practical demonstration during an Animal Science Day at the Bethlehem Research Station and were attended by 55 technicians, professional officers and chief professional officers. The third course was reduced to two weeks and was attended by 18 extension officers, chief extension officers and chief technicians.

In the *Eastern Cape Region* technicians and professional officers from 8 extension offices attended various courses, including courses in economics (2 days) and catchment planning (5 days).

This Region, also drew up a comprehensive in-service training programme for technicians, because the duties of what used to be two groups of technicians (soil conservation and extension technicians) have now been combined. The purpose of the programme is to augment every technician's basic training so that he will be able to carry out the whole range of his duties satisfactorily. This in-service training effort has already progressed so far that it will be completed by the end of 1973. In this programme 16 subjects are offered, chiefly by means of lectures.

In the *Transvaal Region* three professional officers and one technician attended a 5-week course in soil classification. One chief professional officer attended a 9-week course in organisation and management.

Officers in the *Natal Region* attended courses dealing with flow diagrams (3 days), computer programming (3 days), beef cattle systems (1 day) and the protection of fields (5 days).

AGRICULTURAL EDUCATION

Student numbers at the four Faculties of Agriculture, and the degrees conferred, were as follows:

Student numbers at Faculties of Agriculture, 1973
(The numbers in brackets are those of the previous year)

Faculty	Undergraduate (1st – 4th years)	Post-graduate
Natal	212[1] (191)	63 (62)
Stellenbosch	209[2] (251)	90 (103)
U.O.F.S.	146[3] (128)	62 (58)
Pretoria	256[4] (260)	143 (128)
Total	823 (830)	358 (351)

1 – Including 21 B.Sc. Agricultural Engineering students
2 – Including 87 B. Agricultural Management and 7 B.Sc. Agricultural Engineering students
3 – This includes 38 B.Agric. students
4 – 50 Students in Agricultural Engineering to be added

In addition to the degrees listed above, 3 B.Sc. certificates in Agricultural Engineering were conferred at both the University of Stellenbosch and the University of Natal.

Pregraduate and postgraduate students in Veterinary Science, U.P. (Previous year's figures in brackets)

2nd yr. – 5½ yr	188 (189)
M.Med. Vet.	49 (49)
D.V.P.H.	2 (4)
D.V.Sc.	13 (14)

Degrees conferred in Veterinary Science, 1971/72
(The numbers in brackets are those of the previous year)

Faculty	B.V.Sc.	M.Med.Vet.	D.V.V.G.	D.V.Sc.
Pretoria	40 (36)	2 (–)	1 (–)	2 (–)

Degrees in Agriculture conferred, 1972/73
(The numbers in brackets are those of the previous year)

Faculty	B.Agric.	B.Sc.	B.Sc.Hons.	M.Sc.	D.Sc.D.
Natal	–	40 (41)	–	10 (18)	6 (–)
Stellenbosch	27 (–)	33 (45)	25 (29)	12 (16)	4 (4)
U.O.F.S.	11 (–)	20 (32)	13 (8)	5 (10)	3 (4)
Pretoria	–	41 (33)	12 (9)	15 (6)	6 (7)
Total	38	134 (151)	50 (46)	42 (50)	19 (15)

Young farmers sitting for an examination in wool typing during a short course on wool classification at the Grootfontein College of Agriculture

Formal training at Colleges of Agriculture is designed mainly to meet the training needs of prospective farmers and persons interested in serving the agricultural industry in the technical field.

Student numbers at Colleges of Agriculture, 1972/73
(The numbers in brackets are those of the previous year)

College	Student numbers
Cedara	106 (115)
Glen	65 (59)
Grootfontein	46 (27)
Neudam	41 (33)
Potchefstroom	102 (107)
Stellenbosch-Elsenburg	104 (100)
Total	464 (441)

In addition to the formal training given at Colleges of Agriculture, a wide variety of short courses are offered to farmers. This service includes:

Short courses offered by Colleges of Agriculture

College	Number of courses	Attendance
Cedara	19[1]	349
Glen	18[1]	492
Grootfontein	6[2]	273
Neudam	1[3]	36
Potchefstroom	29	914
Stellenbosch-Elsenburg	8[1]	399
Total	69	2 463

1 – Including all courses held in the Region concerned
2 – Certain other courses, attended by 502 persons, were offered in other centres
3 – A total of 54 short courses attended by 1 009 persons were held in various other centres in the South West Africa Region

Comparison of the attendance figure at short courses held during the year under review with last year's figure shows a rise of almost 63 per cent. This is an indication that the farmer is becoming increasingly aware of the value of these short courses.

The following table gives one an idea of the variety of courses offered either at one of the six Colleges or at various other venues in the Region.

Region	**College**	**Short courses – field or subject**
Natal	Cedara	Engineering; seed potato and potato production; forestry; artificial insemination; wool classing, wool and sheep demonstrations; computer programming.
Free State	Glen	Advanced dairying; artificial insemination; S.A. Mutton Merino; beef farming; Africander cattle judging course; cream testing and grading; dairy farming; milk testing; Karakul farming; stock diseases.
Karoo	Grootfontein	Dorper sheep; home economics; tractor maintenance; veld management; the training of sheep dogs; fleece testing; irrigation farming; agricultural engineering.
South West Africa	Neudam	Karakul course for beginners; refresher Karakul course; advanced Karakul course; pastures; leadership; artificial insemination for cattle; Karakul lamb description.
Highveld	Potchefstroom	Veterinary science; dairy farming; beef production; S.A. Mutton Merino; Dohne Merino; winter cereals; maize and grain sorghum; oilseeds; fumigation; dry beans.
Winter Rainfall	Stellenbosch-Elsenburg	Grain grading; insect control in stored grain; dairy cattle; winter cereal cultivation and marketing; grazing management; cattle farming; milk production; Wool School.

As may be seen from the details given above, a large variety of short courses are offered, and this helps a great deal to place the industry concerned on a sound footing. These courses are also becoming increasingly important in the extension process as a whole, the aim of which is to put across agricultural information and skills to the farmer.

PUBLICATIONS

Popular Publications

In the monthly journal *Farming in South Africa,* 107 articles were published on farming matters and 70 articles appeared in the section *The Woman and Her Home.* Of three series of articles on maize, the drying and storing of agricultural products, engineers' testing reports on mouldboard ploughs, 11 600 reprints of each were distributed free to farmers. A special supplement was published on the South African wine industry, of which 10 350 copies were printed. In addition, reprints of 10 other articles with limited editions were made available to Regions and Institutes for distribution to interested farmers.

The journal *Farming in South Africa* ceased publication on 31 March 1973 and is being replaced by a comprehensive series of pamphlets. In this way it is hoped to serve the farming community more effectively by meeting the specific requirements of farmers in definite areas and so achieving the aims of optimal development of resources.

This change became necessary because the agricultural industry in South Africa has become so specialised that a general periodical published on a country-wide basis can no longer effectively meet the requirements of farmers. To serve effectively this widely divergent industry at each level within specified areas, the regular supply of short, topical and applicable publications is essential.

The pamphlet series cannot be introduced all at once. The series on tobacco and bananas have, however, been completed, while other series are being prepared. Good progress has been made with citrus and subtropical fruit, horticultural products and various engineering subjects.

As a result of requests, many from organised agriculture, the circulation of the weekly newsletter, *Agricultural News,* was extended on a selective basis.

Altogether 210 450 pamphlets and brochures, 98 000 copies of *Agricultural News,* 99,650 other newsletters and 7 000 library lists were distributed. In addition, 360 000 copies of 12 pamphlets were supplied to the Wool Board for distribution to wool farmers as a supplement to its publication *The Golden Fleece.* A total of 13 818 pamphlets was sold.

A popular pamphlet on grape cultivation in the summer rainfall areas was published, while various other publications were edited for other Departments and prepared for lithographic printing.

In addition to the Departmental annual report (1971/72), four editions of the quarterly *Agrekon* were edited on behalf of the Department of Agricultural Economics and Marketing. Two pamphlets were prepared for the Department of Forestry, as well as one edition of the periodical *Forestry in South Africa.*

Scientific Publications

Agricultural Science in South Africa

Agroplantae, Agroanimalia, Agrochemophysica, Phytophylactica – During the year, 109 contributions (88 English and 21 Afrikaans) were received, the same number as during the previous year. Together with a carry over of 77 contributions from the previous year, 186 contributions were, therefore, considered. Of these, 108 were approved, 7 rejected, 5 withdrawn, 12 either cancelled or transferred to *Technical Communications* and 54 are still under consideration.

Of the 108 improved contributions, 79 were published and 29 were carried over to the following year. The year under review thus ended with a carry over of 29 approved contributions and 54 still under consideration. Of these 83 contributions, 11 were received during 1971/72 and 72 during 1972/73. Of the 29 approved contributions, 4 dated from 1971/72 and 25 from 1972/73.

Onderstepoort Journal of Veterinary Science – Five editions of this journal appeared and considerable progress has been made towards ensuring publication of the journal on due date. The editions which have appeared are Vol. 39, Nos. 1, 2, 3 and 4 and Vol. 40 No. 1. Altogether, 24 contributions were received during the year, of which 17 were published.

Other scientific publications – Ohter scientific publications appeared as follows: Bothalia, Vol. 10, No. 4 and Vol. 11, No. 1 and 2: Flowering Plants of Africa, Vol. 42. Parts 1 and 2; Entomology Memoirs, Nos. 26, 27, 28, 29, 30, 31 and 32; Technical Communications, Nos. 103, 104, 105, 106, 107, 108, 109 and 110; Botanical Survey Memoir No. 39.

AUDIO-VISUAL SERVICES

During the year, 13 synchronised slide series were completed and work is proceeding on a further series of 21 which have reached various stages of completion.

In addition to an exhibition at Nelspruit, an exhibition "Careers in Agriculture" was presented in Johannesburg in co-operation with the Public Service Commission. Another exhibition was held in the Central Agricultural Library, Pretoria.

Assistance was given to various organisations by means of lectures, demonstrations and judging. These organisations included the Department of Planning and the Environment, the National Veld Trust, the National Cultural and Historical and Open-Air Museum and the organisers of the Vaal Triangle Show.

Early in 1972, a multi-screen programme on Man and his Environment was compiled in collaboration with the Departments of Water Affairs and Forestry and shown to interested groups throughout the country. This programme, which focussed special attention on pollution aspects, was shown to some 80 000 people. In 1973, there was liaison with the campaign "Our Green Heritage" and a multi-screen programme was compiled. The co-operation of the Department of Planning and the Environment was secured in its compilation and presentation and many successful exhibitions have already been held.

RADIO

The radio programme (10 half-hour broadcasts per week) was broadly devoted to optimum soil utilisation. News items and a series of programmes were presented in various forms within this framework and dealt with animal and plant production, mechanisation, economic aspects of management in the agricultural industry, prices of products and marketing.

Special attention was paid to the reports of the Commission of Inquiry into Agriculture. During the second half of the year a beginning was made with broadcasts dealing with the Green Heritage campaign.

LIBRARY SERVICE

Of a total of some 3 000 questionnaires sent to farmer members in connection with the use of library facilities, 570 (that is, about 20 per cent) were returned. The information thus obtained provided an interesting picture of reader customs and habits and of the country-wide interest of private members in the library service. What emerged particularly strongly from the questionnaires was that library members, especially those in outlying areas, regard the service rendered by the Central Library as being indispensable.

The first library week was arranged in October 1972 to coincide with the "International Year of the Book". An exhibition depicting the role of the library in the activities of the Department was arranged by the Division of Agricultural Information in the library and officially opened. A brochure "Guide to the Services of the Central Agricultural Library" was made available during the official opening and has since been given to every new member.

A beginning has been made with the compilation of a complete catalogue of publications by former and present officers and researchers of this Department. At the same time an effort is being made to collect the publications concerned so that at least one complete set will be available in the Department.

The library was represented at the annual farmers' day held at Bien Donné near Stellenbosch. This was the first step in the library's new programme of introducing itself by arranging book exhibitions on occasions such as this.

The feeding of data about periodicals to the computer preparatory to punching has reached an advanced stage but was not fully completed during the year under review.

Altogether 2 553 books were acquired. Of these, 1 435 found their way to branch libraries and 1 098 were placed in the Central Library. The considerable decrease in comparison with last year was due to increases in the prices of periodicals which meant that fewer books could be purchased.

Issues of books and pamphlets by the Central Library totalled 9 110 and 1 665 respectively and some 24 600 photostats were furnished to various inquirers.

3. The Natural Resources

SOIL CONSERVATION

The Soil Conservation Act

During the year under review 1 655 cases of suspected soil abuse came to the attention of the Division of Soil Protection through inspections, complaints and reports by soil conservation committees. In 1 650 of these cases the land users concerned were visited or letters were written to them.

Of the persons approached 1 071 (65,0 per cent) responded favourably and 125 (7,0 per cent) unfavourably. The latter are therefore liable to disciplinary action and personal directions may be served on them. Negotiations are still in progress with 454 (28,0 per cent) of the total number.

Experience again showed that there are very few cases where immediate legal action is possible. There is generally a time-lag between the date when a person suspected of abusing the soil is warned in connection with some form of abuse of the soil or veld and the date when there is sufficient evidence that the person is obdurate and cannot be persuaded to co-operate. The policy of the Division of Soil Protection has always been to try, through negotiation, to persuade offenders to adopt the right views and course of action.

During the year under review 41 personal directions under the Soil Conservation Act were served in cases where land was not being used as it ought to be. During the year seven accused appeared in court and all seven were found guilty.

Towards the end of the year under review another eight cases against accused persons were set down for trial.

The publicity given to these court cases had a beneficial effect on the farming community's attitude towards the provisions of the Soil Conservation Act.

Soil conservation committees

With the passage of the new Soil Conservation Act in 1970 the executive function of soil conservation committees fell away and under the new system their function became chiefly an advisory one. This means that the committees are less active.

However, most committees have already assessed the situation in their respective areas, largely in order to determine protection priorities. Although it is alleged that many of the soil conservation committees' interest seems to be flagging, many of them are doing the work for which they were established.

Regional advisory committees

The regional advisory committees all met during the year. At these meetings various aspects of the state of the soil in the various regions were thrashed out and problems in connection with protection matters and priorities on the various agendas were discussed

The Soil Protection Advisory Board

The Soil Protection Advisory Board met three times during the year under review and undertook a tour to the Northern Transvaal Bushveld to investigate the effect of the Veld Reclamation Scheme on the veld.

After the tour the Board made the following findings:

(a) The Board was in agreement that the disastrous drought of 1966 had required special measures.

(b) Although evidence to the contrary was heard, the Board was convinced that the Veld Reclamation Scheme had made a contribution to veld reclamation, as well as to the whole educational process with regard to judicious pasture utilisation.

The Board pointed out the following specific matters noted in the course of its tour:

(i) Too high a grazing intensity was still maintained in the Northern Transvaal Bushveld and the fact that the game factor was not taken into account as it should be in this connection was causing concern.

(ii) Game farms are another source of concern. The Board requested the Department to go into the whole question of including and controlling game in ordinary farming enterprises, or in separate game-farming enterprises, and to bring out a report on the basis of which recommendations could be made.

(iii) The Board noted with concern that the bush was becoming denser. In due course a report would be requested to enable the Board to decide whether correct grazing control on its own would be sufficient to control bush encroachment in the long run or whether additional control measures would have to be instituted.

(iv) The Board expressed its concern about the inclusion of small stock in farming in the Bushveld and the effect this would have on the grazing.

Farmers' works

The expenditure on subsidies and grants in respect of completed soil conservation works increased very little in comparison with the previous year:

Year	Subsidies on completed soil conservation works	Grants for flood damage repaired	Grants for grass ley crops in fields
	(R)	(R)	(R)
1968/69	2 244 274	–	8 366
1969/70	2 852 828	–	6 688
1970/71	2 967 684	599	11 849
1971/72	4 042 794	2 219	13 000
1972/73	* 4 239 404	10 161	15 684

* This amount includes R1 532 137 for subsidies on completed soil conservation works in South West Africa, which also fall under the new Soil Conservation Act as from 1 April 1971.

The subsidies on completed soil conservation works do show a slight rise, but this was due to subsidies paid in South West Africa. In the Republic there was really a decrease:

Year	Grants on completed soil conservation works in the Republic	Grants on completed soil conservation works in South West Africa
1968/69	2 244 274	–
1969/70	2 852 828	–
1970/71	2 967 684	–
1971/72	3 023 651	1 019 143
1972/73	2 707 267	1 532 137

It appears that the drop in the number of completed soil conservation works cannot be ascribed to a drop in the demand for survey work, but probably to the steadily deteriorating staff position.

The chief reason why subsidies on completed soil conservation works in South West Africa are rising is that the tariffs on which subsidies are calculated, and the percentage of the subsidy that is paid on a completed work, are more favourable than they were when the subsidy for soil conservation works still fell under the Administration of South West Africa.

Most completed works are indirect erosion control works such as internal camp fencing and stock-watering points. Direct erosion control works are still not enjoying the attention they deserve.

Major farmers' works continue to receive relatively little attention in this territory, but as area planning progresses they will be given more attention. During the year under review 10 major farmers' works were prescribed for construction in recognised catchment areas.

State works

The design and construction of big soil conservation works aimed at stabilising water courses are still progressing well. Operations were concentrated on the erection of new works in the Upper Orange catchment area, although existing works also had to be maintained.

The following shows the progress made with the building of new State works, as well as repairs to damaged works:

State works: erection and repairs

Catchment area	New works completed		Repairs completed	
	Number	Value (R)	Number	Value (R)
Upper Vet River	1	220 908	6	9 400
Sand River			5	53 949
Melkspruit	1	17 683		
Nieuwejaarspruit	7	167 305		
Sundays River	1	185 900	1	9 431
Broekpoortspruit	3	173 963		
Vlekpoort River			4	72 577
Elands River			1	3 960
Total 1972/73	13	765 759	17	149 317
Total 1971/72	9	401 071	9	115 979

Soil conservation research

A soil conservation research team at Aliwal North is doing valuable research on the development of new techniques for stabilising water courses and speeding up the sediment build-up above soil conservation works. It was shown that the reclamation effect of soil conservation works could still be extended after 20 years.

Results obtained with treated-pole jacks and gabion groynes indicated that effective control of caving in of river banks was being obtained.

In the course of an investigation into sediment build-up above weirs in the Highveld Region, it was found that trees in water courses are as harmful in this region as in water courses in the drier Karoo Region.

Veld Reclamation Scheme

The Scheme was instituted on 1 September 1966 for a period of five years, with the aim of withdrawing grazing from use in the cattle grazing areas of the Northern Transvaal and Northern Cape. Certain sheep grazing areas of the North-Western Cape, the Karoo and Namaqualand were included under the Scheme up to the end of 1969, after which these areas were switched to the Stock Reduction Scheme.

In 1970 the Veld Reclamation Scheme was extended to the districts of Christiana, Komga, and parts of Cathcart and Stutterheim.

Applications for admission to the Scheme were accepted up to 31 August 1971. Particulars of the Scheme for the period of participation (1/9/66 to 31/5/73) are given in the following table:

Region	Number of participants	Area of farms entered (ha)	Area of camps withdrawn (ha)	Total amount of grants paid out (R)
Transvaal	1 845	3 566 330	1 063 895	2 059 612
Karoo	529	4 439 381	1 003 948	547 067
Free State	354	1 671 389	456 951	387 650
Eastern Cape	54	71 441	18 999	97 336
Total	2 782	9 749 541	2 543 829	3 091 665

American agaves on a farm in the Karoo. They are not only used for combating erosion but are also a valuable source of drought fodder

The Scheme was closed on 31 May 1973 and the expenditure as reflected in the table above is virtually the final expenditure.

Reports from the areas where the Scheme applied indicate that the Scheme did not come up to expectations. The reasons for these disappointing results include the following:

* Too long a resting period was required – two growing seasons with a winter in between; and

* too high a stocking rate on the parts of the farm not entered under the Scheme, as well as subsequent over-utilisation of the camps that had been rested.

As participation in the Scheme progressed, it became clear that if the subclimax and pioneer grasses, which dominate the grass stand after a growing season's rest, are not grazed during the following winter, a large percentage of these grasses die out owing to their high light requirements.

Grazing during winter is therefore necessary to reduce overshadowing after the grass has grown out well. Another consideration is that veld that has been rested during the entire growing season should be grazed lightly in winter so that the stock can loosen the soil and create a more suitable seed bed.

Although the direct results of the Scheme were somewhat disappointing, there were many encouraging indirect results, chief of which was a change in the attitude of the farming community towards the resting of veld. There is indisputable evidence that:

* farmers' attitude towards effective veld utilisation practices has never been as favourable as it is at present; and

* there is a general growing awareness of sound grazing control systems, because almost every extension ward has a programme or study group where the accent falls on pasture improvement and on judicious utilisation.

The Veld Reclamation Scheme has therefore been a very real, if indirect, success.

The Stock Reduction Scheme

On 1 October 1969 the Stock Reduction Scheme was instituted for a period of five years. Applications were therefore to be accepted up to and including 30 September 1974.

A watercourse between lands in the Swartland. Much of this area has been contoured and good progress is also being made with the construction of waterways

Over a period of two years the Scheme was very well publicised by the Extension Service of the Department of Agricultural Technical Services and the total number of applicants increased from 200 in December 1969 to 5 860 in October 1971. This was beyond even the wildest expectations. The number of small stock units withdrawn with compensation, together with units that will be withdrawn within the next year by applicants already on record, will be about 5 million.

The original 3-million target will therefore be exceeded by far, and the original aim of the Scheme has therefore largely been achieved.

The following tables give further particulars of the Stock Reduction Scheme. (Since no further applications have been received after 29 February 1972, the data with regard to participation are final.)

According to the following table, almost 46 per cent of the total number of participants are in the Karoo Region, and 54 per cent of the total farm area included in the Scheme consists of Karoo farms.

Applications to participate approved (final)

Region	Number of participants	Area completely and partly withdrawn (ha)
Karoo	3 481	15 398 027
Free State	1 899	4 697 042
Eastern Cape	1 240	1 559 817
South West Africa	546	4 857 897
Winter Rainfall	482	2 350 759
Total	7 648	28 863 542

Under the Stock Reduction Scheme complete withdrawal of farms from grazing was also possible. The smallest number of stock that could be withdrawn was one-third of the calculated carrying capacity, but all the stock could be withdrawn.

The following table shows the number of participants in the Scheme who withdrew only one-third, as against participants who withdrew all their stock.

Region	Stock reduced by one-third or more		All stock withdrawn	
	Number of participants	Area (ha)	Number of participants	Area (ha)
Karoo	3 148	14 767 782	335	630 245
Free State	1 704	4 472 773	195	224 269
Eastern Cape	1 045	1 412 145	195	147 672
South West Africa	546	4 857 897	–	–
Winter Rainfall	378	2 013 649	104	337 110
Total	6 821	27 524 246	827	1 339 296

According to this table only 827 (11 per cent) out of a total of 7 648 participants withdrew their farms entirely from grazing.

Certain conditions for participation were imposed at the institution of the Stock Reduction Scheme. One of these conditions was that a participant's unweaned livestock did not count.

As participation in the Scheme progressed and control inspections were carried out it soon became clear that:

- unweaned livestock cannot be controlled; and
- these unweaned livestock were nevertheless run on the veld and did not have the desired effect of reduction.

To solve this problem and enable the Scheme to achieve its object, the Department decided on 23 May 1972 to amend one of the conditions of the Scheme, viz that unweaned livestock do not count. This amendment was to the effect that livestock which had not yet cut their permanent teeth (i.e. stock from birth to the age when they cut their permanents) should count and be reckoned at 0,4 of a livestock unit.

Because this change in the conditions was a fairly drastic one, the Department gave the old participants the opportunity of reconsidering their position under the Scheme. Such participants could either accept the 0,4 weighting, or opt for the new conditions, or withdraw from the Scheme without any repayment.

The following table shows how the 1 481 participants who entered under the old conditions reacted when given the option of withdrawing from the Scheme:

Number	Withdrew (conditions unacceptable)		Changed over to the new conditions – remained in the Scheme		Accepted 4/10 weighting – remained in the Scheme	
	Number	Percentage	Number	Percentage	Number	Percentage
2 482	818	33	613	25	1 033	42

It is clear from the foregoing table that only 33 per cent of the participants under the old conditions (2 482) withdrew from the Scheme owing to the change in conditions. If this number (818), as against the total number of participants (7 648), constitutes only approximately 10 per cent.

Participants who feel that their veld has recovered to such an extent after a period of participation that it is unnecessary to participate for the full five years the Scheme normally lasts can apply to the Department to withdraw from the Scheme. The Region concerned then sets up a committee to judge the participant's veld. If the committee agrees that the participant's veld has recovered sufficiently, the participant withdraws from the Scheme without refunding any payments already received.

The following table shows how many farmers have withdrawn from the Stock Reduction Scheme since its institution on the strength of veld recovery, and the area of veld involved:

Region	Number	Area of veld which had recovered sufficiently
Karoo	2	9 091 ha
O.F.S.	26	105 325 ha
Eastern Cape	7	12 125 ha
S.W.A.	10	81 213 ha
Total	45	208 754 ha

The Stock Reduction Scheme entails considerable expenditure by the State, since compensation is paid for the number of stock calculated to have been withdrawn. The following table reflects this expenditure up to the end of the 1972/73 financial year:

Year	Total expenditure in all areas where the Scheme applies	
	Republic of S.A.	S.W.A.
1970/71	R 611 853	–
1971/72	R 7 906 502	R 321 900
1972/73	R10 713 940	R1 057 607

The amount as shown to have been spent on the Stock Reduction Scheme in the table above will increase considerably. The participation of the last farmers to join will only terminate in February 1978.

Compared with the rather disappointing results of the Veld Reclamation Scheme, the picture as regards the Stock Reduction Scheme looks a great deal more promising.

At this stage already it can be reported that:

* the veld of participants in the Scheme is generally considerably better than the veld of non-participants;

* farmers in general are far more veld-conscious (particularly with regard to the carrying capacity of the veld) than ever before; and

* there is much evidence from participants that they lost little or no income by taking part in the Scheme and that they are much pleased with the improvement in their veld.

The Department finds it gratifying that by far the majority of the participants are co-operating so well.

Protection of fields

Mechanical protection

The mechanical protection of fields is not yet receiving the attention it merits. Cultural practices on such fields as have been contoured also leave much to be desired. Apart from the fact that there are many cases where the maintenance of contours suffers through serious neglect, terracing on the older cultivated fields is becoming so widespread that it is creating far greater and more costly problems than the advantages which the contour system has to offer.

The absorption capacity of most cultivated fields is gradually diminishing, so much so that fields with a gradient of 1½ per cent and less are already showing serious erosion. The disturbance of the soil structure has a lot to do with this, and the only way of rectifying or at least improving matters is by modifying cultural practices and/or rotational cropping systems.

Marram grass *Ammophila arenaria* can be used most effectively for stabilising drift-sand. The grass was imported from Europe and is now found in coastal dunes in many parts of the South-Western Cape. It spreads by means of rhizomes

For years it was not impossible to make much progress with the construction of waterways. A change is evident, however, because in the Highveld Region alone 619 waterways were measured up during the year under review, as againste only 151 the previous year. Other regions also report good progress. It appears that waterways, which are a prerequisite for the contour construction, are slowly beginning to get the necessary attention.

In the Winter Rainfall Region 2 821 km of contour banks were completed. In the Highveld Region 1 400 km of contour banks were marked out and 1 091 of them were approved in Natal.

This break-through is chiefly due to the fact that more attention has been given to the hydrological planning of areas during the past few years. At the same time extension programmes were instituted in many of the areas to speed up the planning of run-off control.

During the year under review several fields in various areas were again withdrawn from cultivation following personal directions, until such time as suitable stormwater furrows, contours and waterways are constructed. The effect of this has been to make farmers take the mechanical protection of fields more seriously.

Owing to very dry conditions, wind erosion problems were again widespread. In the North-Western Free State, for instance, where a large percentage of light, sandy soils are ploughed, the dry topsoil layers were extremely prone to erosion.

Well-tried cover crops such as weeping love-grass, blue buffalo grass, dryland lucerne, etc., are grown with good results in the North-Western Free State in an effort to protect fields against factors such as wind erosion.

The biological protection of fields

The cultivation of restorative crops on the scarce and steadily deteriorating cultivable land in the Republic is not progressing as well as it should. However, it is an encouraging sign that the grants in respect of the grass ley crop recovery scheme for fields increased from R13 000 last year to R15 684 this year.

Considering the area and the importance of the Republic's croplands, however, this expenditure is insignificant. Continuous crop cultivation and the removal of crop residues by grazing, in some cases even by burning, are still common practices.

Soil conservation competitions and farmers' days

In the Transvaal Region 37 farmers' days were attended by 1 460 interested persons. The farmers' day at the Carnarvon Experimental Farm, the theme of which was grazing management, was attended by 150 farmers.

In South West Africa the Star Competition, which was launched by the South West African Agricultural Union, was continued and several one-star and two-star farms were designated under the auspices of farmers' societies and district unions.

Three master conservation farmers' days were held in South West Africa and the master conservation farmers were given the opportunity of telling their own success stories to the other farmers.

Catchments

State acquisition of land in catchments

Eleven catchments in the Eastern Transvaal were investigated by interdepartmental committees. One catchment (at Lydenburg) has now been proclaimed and instructions have been given for the acquisition of two properties on which the Queen's River has its source. Control over this catchment is now in the planning stage.

Catchment planning

Despite staff shortages satisfactory progress is being made with the planning of run-off control in all the Regions. The support this matter is gaining from officers of the Department as well as from farmers is most encouraging, and applications for replanning on the basis of area or run-off control planning are received regularly.

Attention is at present being given to 38 subcatchments in the Upper Orange Catchments. Plans for these areas are at various stages of development.

Outside the Upper Orange Catchment, attention is being given to various other run-off control areas. The following table shows the extent to which various Regions are involved in such planning projects.

Region	**Number of area planning projects outside the Upper Orange River Catchment**
Highveld	9
Eastern Cape	2
Transvaal	2
Winter Rainfall Area	2
S.W.A.	2
Total	17

In the Highveld Region 24 subcatchments (15 in the Upper Orange and 9 outside the Upper Orange) are involved in catchment area planning. This includes 794 farming units with an area of 279 650 ha, or 2,4 per cent of the Region as a whole.

Driftsand control

Coastal driftsands fall under the control of the Department of Forestry, which is conducting intensive research in this connection. The research is aimed at stabilising driftsands, and considerable success was achieved during the past year. In South West Africa along the West Coast, for instance, various types of saltbush which are irrigated with sea water have been established on the dunes. The stabilisation of the dunes with wooden barriers has also been continued.

The stabilisation of active driftsands is a long process, however, and progress has been exceedingly slow. The measures taken to control active wind erosion along the coast include the covering of sand-dunes, strip cultivation, fencing off, withdrawing land from grazing and cultivation, and the planting of trees as windbreaks wherever this is feasible. The cost of such measures is very high.

The subdivision of agricultural land

The injudicious subdivision of agricultural land into units that are not viable is considered in all quarters to be one of the greatest problems in South African agriculture. The Subdivision of Agricultural Land Act was passed for this very purpose: to prevent further carving up of land. This aim has already been largely achieved, as in evident from the drop in the number injudicious subdivisions.

Since the Act came into operation on 2 January 1971, 3 221 applications have been received for

Mr J.H. Coetzee, of the Highveld Region, with the sand trap he has designed. This is an instrument to measure the intensity of soil losses caused by wind, as well as the migration of soil over an area. It separates material caught at four different heights above the ground, as well as from four different directions.

subdivision, registration of undivided shares, township development and for other purposes.

Applications under the Subdivision of Agricultural Land Act, 2 January 1971 to 30 June 1973

	1/1/71 – 30/6/71		1/7/71 – 30/6/72		1/7/72 – 30/6/73		Total	
	Number	%	Number	%	Number	%	Number	%
Number of applications approved	337	54	806	69	977	69	2 120	66
Number of applications refused	184	29	287	24	225	16	696	22
Number of applications withdrawn	105	17	61	5	37	2	203	6
Number of applications pending	–	–	20	2	182	13	202	6
Total	626	100	1 174	100	1 421	100	3 221	100

A high percentage of the applications during the first few months would have resulted in injudicious cutting up of agricultural land, and up to 30 June 1971 only 54 per cent of these applications were approved. As the public, surveyors, attorneys and other intermediaries became more familiar with the aims of the Act and with Departmental policy, a change took place and a larger number (69 per cent) of the applications could be approved.

Taking into account the finalised applications only, the percentage of approved applications during the past year was 81. The increase in the percentage of approvals may be ascribed to greater selectiveness on the part of the public or their representatives, and more instances of consolidation of farming units. A considerable number of small units were therefore consolidated.

Apart from the prevention of the subdivision of agricultural land into undersized units, the Act is also aimed at preventing good agricultural land being used for non-agricultural purposes as far as this is practicable. More and more agricultural land is required for non-agricultural purposes such as extensions to cities and towns, country living, holiday resorts, or for commerical and industrial purposes. In 25 per cent (or 704) of the applications the owner of the land intended to use one or more portions of it for purposes other than agriculture.

Where rural residential areas or the subdivision of farms into smallholdings was intended, applications could only be granted in exceptional circumstances, since there is as yet no such thing as effective planning of peri-urban areas. Moreover, this type of subdivision is generally not recommended by the Department of Planning and the Environment or the provincial authorities.

In the case of township development or where mining, industrial or commercial developments were being planned, subdivision was permitted in 83 per cent of the cases.

It is clear that the Subdivision of Agricultural Land Act can only prevent the further injudicious carving up of agricultural land, and that some other remedy must be found for cases where land is owned by a large number of persons holding undivided shares, or where land is unsuitable for agricultural purposes as a result of subdivision.

SOIL FERTILITY

Work has now been completed on a phosphorus calibration study with maize on the sandy hydromorphic soils of Northern Natal. Two cardinal points are used, one which is designed to give maximum profits per hectare and another which is designed to give maximum return on money invested in phosphorus fertiliser.

Over two seasons the net profits from these highly fertilised ranges have been 60 per cent higher than the net profits obtained from ranges which received fertiliser applications equivalent to those used by above-average farmers in Northern Natal.

At Vaalharts it was found in the course of fertilisation studies that, if phosphate fertiliser is broadcast and ploughed in, only the phosphate status of the upper layer of the soil is raised. On Vaalharts soil that had been receiving phosphate fertilisation for many years it was found that the phosphate level in the topsoil could be as high as 35 parts per million, whereas the subsoil (20 cm and deeper) contained only 3 parts per million or no phosphorus.

It was also found that where superphosphate was placed at a depth of about 45 cm with the aid of a special implement, far better root development was obtained with cotton plants.

It was also established that potassium does not appear to move about readily in the soil. A fertilisation trial showed that the broadcasting and ploughing in of a potassium fertiliser did not affect the potassium level of the soil at depths below about 30 cm. Where the topsoil showed a potassium level of about 200 parts per million, the subsoil contained only about 100 parts of potassium per million.

By following a sound fertilising programme, many farmers have succeeded in building up the nutrient level of their soil above the 30 cm mark to a high degree. Below 30 cm, however, most soils are poor in plant nutrients.

Fertilising practices

After research on the seasonal intake of phosphate, undertaken with the aid of radio-active phosphorus, the present practice was adopted of fertilising fruit trees in instalments, these being applied as near to the time of maximum intake as is practicable.

Results showed that all the macro-elements (nitrogen, phosphorus, potassium, calcium and magnesium) are actively absorbed during spring and autumn. With the exception of potassium, these elements are also absorbed to some extent during summer.

The trace elements manganese, iron, copper and zinc are also absorbed actively during autumn, but on the whole little absorption takes place in spring. These elements are also actively absorbed towards the end of summer, but before leaf fall. On the other hand, the boron absorption pattern was more like that of nitrogen and phosphorus.

This study also showed that nutrient reserves absorbed during autumn supply a large part of the requirements of the new growth during the ensuing spring. This underlines the importance of autumn feeding, and this aspect was the subject of further investigation. The results obtained so far show that nitrogen deficiency during autumn makes for earlier leaf fall and results in a low nitrogen level in the permanent parts of the tree. Apple trees in this condition are far more subject to delayed budding than trees that have received a nitrogen dressing in autumn.

The response to a spraying with a dormancy-breaking preparation, DNOC, was also very poor in comparison with the response of a tree that had received sufficient nitrogen in autumn.

Mineral deficiencies

Because the percentages of stone present in soils are not always taken into account when determining lime requirements, overliming occurs in practice, which gives rise to zinc and manganese deficiencies in small grain on inadequately buffered soils in the Winter Rainfall Region.

In the Bredasdorp-Strandveld area the importance of copper, zinc and manganese deficiencies was confirmed, particularly on soils that had never been cultivated before.

Leaf spraying has long been applied in the control of most micro-element deficiencies in fruit trees. So far it has not been possible to solve iron deficiency problems by means of leaf sprays – the only solution was a fairly expensive soil application with iron chelate 138.

A new leaf spray, Fetrilon, was tested this year and it gave very satisfactory results provided that it was applied *as soon as* the first sign of the deficiency became visible. Although three sprayings with this preparation in the course of the growing season are required, the cost is nonetheless far lower than the cost of a soil dressing.

Use of fertiliser

Fertiliser consumption in Northern Natal is increasing at a significantly higher rate than in the Republic as a whole. Between 1966 and 1970 consumption in Northern Natal increased by 132 per cent, whereas the national increase over the same period was 24 per cent. Most of the increase is due to greater use of nitrogen and phosphorus.

It appears that the use of fertiliser is still increasing, judging by the sales figures of a co-operative in the North-Western Highveld. From 1971 to 1973 sales of nitrogenous fertiliser increased from 3,5 million kg to about 6 million kg.

Experts are nevertheless of the opinion that farmers in general apply too little nitrogen fertiliser for optimum crop yields.

The use of fertiliser in the Karoo Region again showed an increase, particularly with regard to the application of agricultural gypsum on alkaline and brack soils. Trials and the experience of farmers have shown that the use of fertiliser and agricultural gypsum is essential if sustained, high yields are to be obtained.

The use of fertiliser in South-West Africa has not increased significantly. Most farmers still use kraal manure and other organic matter to fertilise their fields.

OTHER SOIL AND WATER STUDIES

The Irrigation Research Subdivision of the Soil and Irrigation Research Institute started functioning last year. Its activities were chiefly to expand research facilities, carry out urgent research work on existing irrigation systems, and develop new irrigation schemes.

A mobile laboratory was equipped and used for the *in situ* testing of twelve commercial irrigation systems (flood, sprinkler and drip systems) all over the country; these systems were tested for water delivery, water distribution over and in the soil, and for the eventual augmentation of the ground-water.

Irrigation research facilities were developed on the trial plot of about 4 ha allocated to the Institute at Roodeplaat. Four lysimeters with a capacity of 10 tons each were pruchased and will be installed during the second half of 1973 for use in studies on water consumption and the production of plants.

As regards the development of irrigation schemes, an extensive research programme was launched to determine the physical properties of the soils concerned and evaluate the quality of the irrigation water. The intention is to make a survey of the principal physical properties of the Republic's more important soil types, as well as of the soil water interactions and the quality of the surface water used for irrigation purposes.

Attention was also given to the evaluation of the various types of micro-irrigation systems in use in the Western Cape. The efficiency of this system was investigated on various soil types, and particular attention was paid to water-saving and control over the application of water. A manual for internal use was prepared.

Calcium absorption from soils is very important in apple cultivation, bitter-pit in apples being caused by calcium deficiency. A study of the calcium content of soils produced the following results:

In soil columns it was found that gypsum-lime mixtures were more effective in raising the calcium status of the subsoil than lime on its own. Lime on its own raises the pH and suppresses the exchangeable aluminium more than gypsum does, but the effect of lime is restricted to the zone of application, whereas gypsum moves about. Although gypsum does not always drastically reduce the exchangeable aluminium, it does raise the calcium content and therefore the calcium: aluminium ratio.

According to the latest results a mixture of 75 per cent gypsum and 25 per cent lime works best for raising the calcium status. In a field trial this treatment raised the calcium status of the leaves of apple trees.

Routine gaugings with the neutron moisture gauge in orchards at Bien Donné showed that the density corrections, which were calculated on a theoretical basis, were correct. The values obtained for the field capacity of soils in their natural state could be very well reproduced. Since these values were taken under field conditions and can be taken at various points in the profile, this method has advantages over the laboratory methods.

These gaugings also showed that it is possible to determine the total quantity of water applied to soil with the aid of the moisture gauge. With the overhead irrigation system at Bien Donné surface distribution was uneven and more than twice as much water fell at specific points as at other points. The 20 mm or so applied at a time wet the soil to a depth of no more than about 40 cm, with the result that the subsoil dried out in the course of the season.

Brackish irrigation water

In the Hex River Valley the low rainfall of the past decade or more has depleted the subterranean water sources and is in many cases also responsible for the deterioration in the quality of the water. Resistance determinations performed on water from a large number of boreholes during the past two years showed that there are already a considerable number of boreholes that yield water that is too brackish for irrigation. The harmful substance present in such water is usually sodium.

Where vineyards were irrigated with water containing less than 80 parts per million of sodium, the sodium concentration in the leaves was less than 500 parts per million. In other vineyards, where serious leaf-margin scorch occurred owing to irrigation with brackish water, up to 3 300 parts per million of sodium have been found in leaves.

Brack problems are also beginning to crop up in certain parts of the Elgin area. Pot trials were therefore undertaken with peach seedlings and young apple trees, in order to test the effect of salt concentration and ion ratios. In the peach seedlings the sodium collected mainly in the roots and sodium concentrations of over 10 times higher than those in the stems or leaves have been observed in the roots.

Apple rootstocks differ radically with regard to the quantity of sodium translocated to the leaves, as the following table shows:

Rootstock	Sodium concentration in leaves (parts per million)
MVII	764
Merton 793	913
MM 109	1 950
MM 111	4 161
MM 106	5 673

A survey was made of the ground-water status at the Vaalharts Government Water Scheme, and it was found that:

- ★ the ground-water table is shallower than 4 feet in 47,6 per cent of the Vaalharts soils,
- ★ the water-table occurs chiefly in deep, sandy soil, and
- ★ irrigation water is probably the chief source of the ground-water.

Four other related projects based on this survey are being carried out at Vaalharts to find a solution to the alarmingly high water-table.

NATURAL GRAZING

Veld management

A comparison of four rotational grazing systems in the Free State Region at two stocking rates showed that the body mass of animals in the 12-camp system was better at a light stocking rate. The 3-camp system produced the poorest response, irrespective of the stocking rate. Wool production was fairly even, with an increased yield at the light stocking rate.

Preference studies showed that the same species of grass were utilised under all the systems. Species that were not utilised at all were the *Aristidae, Heteropogon contortus, Elyonurus argenteus* and all big, full-grown tufts containing a great deal of dry material.

During autumn and winter scrub play an important part in the animal's diet. Repeated defoliation per grazing period also occurred under the 3-camp system, but not under the 18-camp system. It was evident that the condition of the veld and not predetermined dates or seasons should dictate when the livestock have to be moved.

In the Northern Cape it was also demonstrated that multicamp systems are the answer to problems of grazing management. As many as 16 camps can be used to great advantage. What farmers are beginning to like about these systems is the greater adaptability and flexibility afforded by more camps (and consequently smaller camps) per herd or flock, since this enables them to modify veld management according to season.

A study of the effect of defoliation by cattle, sheep and mowers during specific seasons and combinations of seasons showed that defoliation in autumn has the worst effect on the veld. This is a pointer to the ill-effects of severe defoliation after rains, and the best precipitations generally occur in the late summer.

Participants in the Stock Reduction Scheme are sticking to a realistic stocking rate, but elsewhere too high a stocking rate remains the chief obstacle to veld recovery.

A survey in the Molopo Soil Conservation District showed that 63 per cent of farmers overstock their farms.

Plant surveys carried out in various veld types of the Eastern Cape Region indicate that there is a general increase in the basal cover of the grass component. This may be ascribed largely to reduced livestock numbers and an increasing awareness among the farming community of how vulnerable the natural veld is.

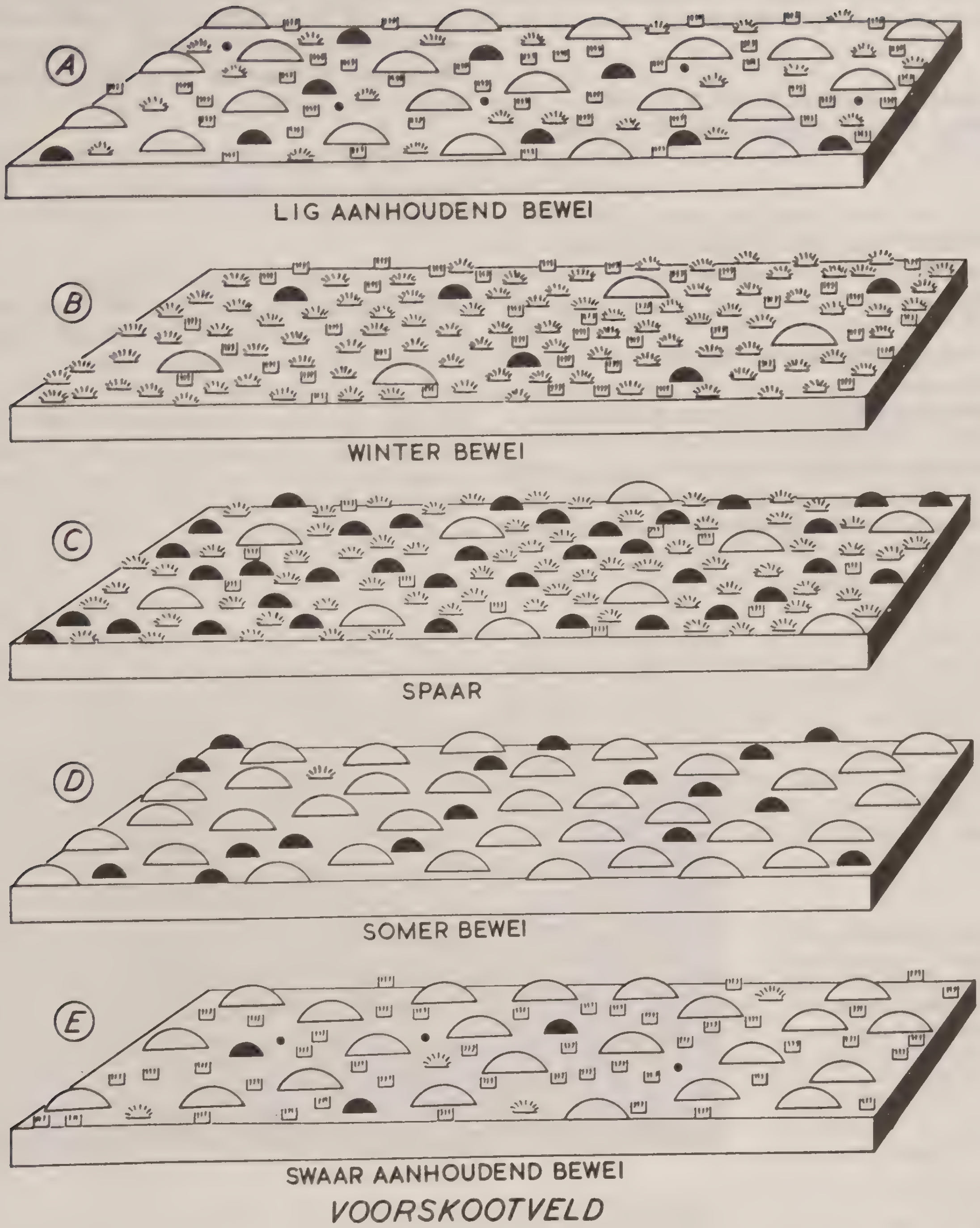
The improvement in the veld on many farms as a result of the Stock Reduction Scheme aroused considerable interest in the resting of veld.

Research in the sourveld area showed that increasing the stocking rate does not necessarily curb species selection. Even at very high stocking rates the most palatable components are overgrazed before the less palatable species are utilised to any significant extent.

In one investigation, where a very heavy stocking rate was applied in an attempt to eliminate selective grazing, it was found that significant utilisation of unpalatable species was only obtained at the expense of the palatable component. On the other hand, it was found that at the recommended stocking rate even the palatable species were not effectively utilised.

The competitive ability of silk grass *Elyonurus argenteus* is such that it occurs high in the plant succession in Dohne sourveld and cannot be rested or grazed to extinction over a short period.

Studies of the nutritive value of Dohne sourveld showed that the provision of supplements in the form of licks during dry spells has advantages even during the summer months.


A
LIG AANHOUDEND BEWEI
B
WINTER BEWEI
C
SPAAR
D
SOMER BEWEI
E
SWAAR AANHOUDEND BEWEI
VOORSKOOTVELD

This diagram illustrates the divergent effects of different grazing treatments on Karoo veld. The black semicircles represent undesirable shrubs, the white semicircles desirable shrubs, the tufts perennial grasses, the little combs pioneer grasses and the black dots volunteer plants

A study to ascertain the effect of winter defoliation of the sourveld showed that winter grazing had a significant and beneficial effect on spring regrowth.

All research results indicate that severe grazing of the valley bushveld of the Eastern Cape is very harmful and that grazing systems should rather be built up round a long resting period, with slow rotational grazing and a relatively low stocking rate.

Veld conditions in the extensive grazing areas of the Winter Rainfall Region deteriorated still further owing to the drought, which was very severe in these areas.

What is particularly striking is that a large percentage of perennial pasture plants died during this period.

A trial with sheep and cattle on the Nortier Experimental Farm proved that grazing late in the growing season is more harmful than early in the growing season.

During the drought of 1971 and 1972 the veld cover diminished, but *Tetragonia fruticosa* increased, which shows how important this shrub is in this area.

A trial was started in the Little Karoo to find a method of reclaiming bergrenosterbos veld as natural grazing by means of slashing, burning and reseeding treatments during autumn and spring. After both the spring and the autumn slashing treatments the renosterbos cover decreased significantly. The bush-slasher is therefore an effective implement for eradicating renosterbos.

In the case of spring burning treatments the renosterbos cover increased significantly in all six replications.

Renosterbos decreased significantly on all six plots burnt during autumn. Autumn burning is therefore a cheap method of controlling renosterbos, cheaper than the equally effective slashing treatment.

However, the total cover in all the camps has dropped very significantly during the past nine years, despite the fact that no grazing has been allowed there. The renosterbos has not been replaced by useful vegetation.

Many gardeners love to plant the sweet-thorn tree *Acacia karoo* but in some parts of the country it is an intruder plant. This farmer in the Queenstown district is successfully combating sweet-thorns with power paraffin

Climax grazing at the Omatjenne Research Station is inspected by Directors and officers of the Crops and Pastures Research Institute during a tour of South West Africa

The results of trials at Omatjenne confirmed that combining cattle and goats or cattle and sheep – or even goats on their own – gives a higher animal production per hectare than running cattle alone does on the thornveld of Otjiwarongo.

The veld has improved a great deal in the camps grazed by goats, these animals having concentrated mainly on the shrubs as a source of food for the past nine years.

It has been found that the goats now utilise much more grass than they did at the start of the trials, because the quantity of shrub grazing under the "goat grazing line" is dropping gradually. If this trend continues, the perennial grass cover will gradually diminish again.

A stocking rate of 1 large stock unit cattle to 5 hectares is clearly too much for this veld; 1 to 10 is nearer the mark.

Trampling by livestock

Considerable progress has been made in the Karoo Region with comparative studies of sheep, goats and cattle with comparative studies of sheep, goats and cattle with regard to the extent to which they trample the veld. For instance, an ox or a cow makes about 400 tracks per 100 m and its equivalent in small stock units would make over 4 000 tracks. It has been calculated from the measurement of walking distances and track area that one sheep makes trakcs with a combined area of 2 ha in twelve months.

Since a sheep treads on the same spot more than twice, only one hectare will be covered with tracks, and of this about 0,21 ha will have only one track on the same spot and 0,01 ha will have as many as 10 tracks on the same spot.

This calculation and the results correlate very closely with camp sizes, carrying capacity determinations and the disturbance of the soil surface and vegetation.

Fertilising the veld

After a trial period of 18 years it is clear that, although pioneer veld responds better to fertilising than climax veld, it is uneconomic to fertilise natural veld in the Central Free State, which has an average rainfall of 500 mm.

Research in the Highveld Region shows that higher production can be achieved by fertilising the veld in parts with a rainfall of 600 mm. If the greatest benefit is to be derived from fertilising, the fertilised veld must be fully utilised when it is growing actively and is therefore of high quality and palatable.

BUSH ENCROACHMENT AND INVADER PLANTS

The encroachment and increase of undesirable woody plants are probably chief among the factors that limit animal production in large parts of the Eastern Cape Region.

Chemical control has great potential, but the successful containment of certain hardy species such as *Diospyros simii, Diospyros scabrida* and *Rhamnus prinoides* depends on the development of more effective weed-killers than are available at present.

The use of a programme of deliberate burning to control macchia vegetation in the highland sourveld has yielded good results. It was found that communities of *Cliffortia linearifolia, Cliffortia paucistaminae* and *Erica brownleae* can be effectively eradicated provided initial burning is followed by further burning within a reasonable period to control seedlings and re-growth.

The incidence of New Zealand tuft-grass *Nassella trichotoma,* an exceedingly unpalatable and undesirable grass, was established in the Districts of Cathcart, Bedford, Molteno, Wodehouse and Barkly East. Organised mechanical control of *Nassella* is at present being carried out in certain districts. The threat which this plant poses to continued stock farming in the high mountainous parts of the Eastern Cape cannot be stressed too strongly.

Hakea

A light infestation in Zululand was eradicated during the year. Otherwise hakea in the Natal Region is limited to a small infested area near the Transkei border where positive control measures are in hand.

American bramble

A small but significant amount of land is reclaimed each year for the establishment of improved pastures, but farmers in general pay little attention to this weed. American bramble is a serious menace in plantations, especially during the establishment period of new plantations on land previously planted to timber that has since been felled. The ultimate answer may be weed control throughout the life of the plantation.

There has been a visible increase in invader plants in the North-Western Free State. The most important are the thorn trees *Acacia karoo* and *Acacia giraffae,* bitter bush *Chrysocoma tenuifolia* and slangbos *Stoebe vulgaris.*

In the eastern part of the Highveld Region invader plants such as brakbos *Aster filifolius* and ouhout

Leucosidea serecea occur as a result of overgrazing. Brakbos was kept well under control by burning the veld in August and resting it until March.

VELD WEEDS

Jointed cactus

In the infested area of the Eastern Cape, which includes parts of the Karoo Region, the area of infested farms increased by 5 120 ha during the past year (0,32 per cent), so that the total area infested now stands at 1 608 393 ha. Only a small percentage of the increase should be regarded as new infestation, since most of the 5 120 ha consists of old infestations that have only now been reported for the first time.

The inspection area has expanded by 396 236 ha (32,6 per cent) since 1964. Only about 50 per cent of the total farm area is actually infested with jointed cactus. 620 645 ha (76 per cent) of the 813 393 ha actually infested has been under control since June 1973.

In the Free State Region jointed cactus occurs on 7 299 ha, of which 2 321 ha (32 per cent) is already under control. Infestations of jointed cactus in other regions are being kept in check.

Research is being devoted to mechanical, biological and chemical control measures all the time. Tordon 3142 has been found to be very effective, and it is also cheaper than 2,4,5-T, which is used at present.

Under favourable weather and other conditions cochineal and *Cactoblastis cactorum* have already vigorously attacked formidable infestations of jointed cactus and drastically reduced them.

During the past year 5 161 200 litres of spray was issued for use against jointed cactus, which is 583 800 litres more than during the previous year.

The success of jointed cactus control depends chiefly on the landowner's control efforts, the landowner in turn being influenced by factors such as finance, labour and rainfall.

Work done at Ashburton showed that a spray containing 1,0% 2,4,5TP/water would effectively control the cactus *Harrisia martinii*. This prompted the investigation of this herbicide for the control of jointed cactus *Opuntia aurantiaca* because the standard spray issued for the control of this weed had given very poor results in Natal. An experimental site was selected in the Msinga Valley near the confluence of the Mooi and Tugela Rivers. Here the *Opuntia aurantiaca* was relatively dense and largely undisturbed.

These experiments indicated that at the optimum concentration level of the three herbicides evaluated 2,4,5TP/water was immeasurably superior to 2,4,5TP/paraffin (standard jointed cactus spray), while Tordon 40/paraffin was only marginally inferior to 2,4,5TP/water.

Silverleaf bitter apple (satansbos) in the Natal Region is confined to one infested area at Ladysmith where systematic spraying with the herbicide Tordon 22K/water over the past 3 years has brought the density of the weed down to a very low level.

One further infestation of silverleaf bitter apple was traced in the South-Eastern Cape during the year under review. At present silverleaf bitter apple occurs at 23 places in the Districts of Humansdorp, Port Elizabeth, Uitenhage, Kirkwood, Bathurst, Fort Beaufort and Sterkstroom. The infestations have been sprayed more than once and are considered to be under control.

Since the control campaign in the Kendrew area was stopped and no spray was made available to farmers outside the area, infestations and regrowth have increased considerably. This position was aggravated by the fact that seed and material carried by the 1971 floods were responsible for the infestation of large areas lower down the Sundays River.

Scaly cactus

Heavy infestations of scaly cactus occur in the Districts of Willowmore, Murraysburg and Steytlerville. Lighter infestations are also found in the Districts of Middelburg, Philipstown, De Aar, Hanover and Victoria West. On the whole the control of this dangerous weed is most unsatisfactory because farmers do not always realise the danger of the infestation.

Imbricate cactus

Imbricate cactus occurs in 52 049 ha in the Free State Region. 35 813 ha or 69 per cent is under control.

Opuntia rosea

During the past year it was found that 3 590 ha on 4 farms in the Herbert District is infested with *Opuntia rosea*. This cactus spreads aggressively. Urgent attention will have to be given to preventing it from spreading further.

Harrisia martinii – Systematic spraying with 2,4,5TP/water over the past three years, at State expense, reduced the density of the weed to such a low level that further control work is to be handed over to the individual land users. This plant, which is confined to Muden and Ashburton in Natal, is remarkably resilient and has been exceedingly difficult to bring under control.

Euphorbia tiraculli has already become dominant in large parts of the Lower Tugela Valley. It is also becoming very conspicuous in the Umkomaas Valley.

Curry's Post weed *Athanasia acerosa* is becoming increasingly conspicuous in grazing land along the foothills of the mountains.

Pereskia aculeata is widely distributed throughout the warmer parts of the Natal Region. It is a potential plantation weed. Armed with vicious thorns, it is a most unpleasant plant to deal with. Being a cactus, any cuttings left on the ground readily take root.

Setaria chevalieri is an indigenous grass that has in recent years developed into a very serious plantation weed in the Cramond District.

POISONOUS VELD PLANTS

Vermeer bush *Geigeria ornativa* is still causing trouble in the Free State Region. Good research results were obtained with the control of this problem, and the solution seems to lie in correct veld management. So much is already known about this plant that large-scale outbreaks of vermeersickness can be contained.

The solution to the problem lies in switching the stock quickly from camp to camp. This means that a number of camps have to be available. Sheep can eat large quantities of vermeer bush without adverse effects, provided they do not graze the bush for more than 14 days. Camps can therefore be grazed clean, provided the animals do not remain in infected camps for longer than 14 days. An 8-camp system that embodies all the principles of preventing vermeer bush poisoning is recommended.

"Maluie" occurs on a few farms in the districts of Herbert, Hay and Barkly West, but little is done to eradicate this plant owing to the density of the infestations and the fact that it is harmless in winter.

Senecio pteropherus assumed spectacular proportions in certain parts of the Eastern Cape in 1970 and 1971, but virtually disappeared from the veld during the year under review. This can be ascribed to the dry spring, which was unfavourable for germination, and to the improvement in the grass cover as a result of good rainy seasons in 1970 and 1971.

It is clear that the incidence of *Senecio pteropherus* is closely related to high soil nitrogen content. As the nitrogen level drops or the nitrogen is fixed by vegetation, *Senecio pteropherus* diminishes.

In the Bankenveld a number of deaths occurred among cattle which had eaten the gousiekte bush *Pachystigma pygmaeum.* The Department's prescribed grazing method to prevent deaths from poisoning by this bush is gaining wider application among farmers. Farmers have also been successful with the spraying programmes recommended by the Department.

Vermeer bush *Geigeria* sp. occurs in the eastern part of the Highveld Region, and, although the incidence has been minimal so far, the matter merits attention. Any further deterioration in the cover of this area would encourage the spread of this poisonous plant.

4. Field Husbandry

MAIZE

The area under maize in the Highveld Region decreased by 20 per cent. In the western part of the Region, which constitutes a large percentage of the total area of the Region, the area under maize dropped by as much as 70 per cent in some districts. This may be ascribed to the serious spring drought which precluded all but late plantings.

The average production per unit of area dropped to 60 per cent of that of the previous season, largely owing to the serious midseason drought.

The area under maize in the Natal Region continues to increase. During the 1972/73 season many farmers were forced to replant because of excessively dry early-season conditions and, although yields were seriously reduced in most areas, few farmers recorded complete crop failures.

The expected increase in the area under maize in the Eastern Cape did not take place, owing to the severe spring and summer drought.

As a result of the poor rainfall during the first half of the growing season, almost all maize plantings in the Northern Transvaal were scorched and fields were ploughed up and planted to sunflowers.

In the marginal field cropping areas of the North-Western Transvaal there was an evident drop in maize planting, but the area under maize and the yields per hectare in the South-Eastern Transvaal are still increasing.

Owing to the unfavourable climatic conditions of the past season far less maize was planted on dry land in the Free State Region than in previous years. The unfavourable growing conditions this year made the problems more clearly discernible. The main difficulties are soils of low potential, poor weed control, moisture conservation, poor stands and low fertilising levels. The few farmers who did take the factors mentioned above into consideration harvested fair crops despite difficult climatic conditions.

Considerably more maize was grown this year than last year on the irrigated land at Vaalharts, Douglas and along the Lower Orange.

The overproduction of lucerne meant that large areas of lucerne had to be ploughed up and replaced with wheat as the winter crop. After wheat, maize was planted as a succession crop.

In the Fish River Valley there was a marked increase in the area planted to maize. Owing to the hot, dry summer the yields were not as high as last year. Experimental work showed that it is preferable not to plant maize later than December in the Fish River Valley.

Breeding and selection

During the year a large number of strains were tested for resistance to boil smut in the Highveld Region. The results show that there are certain strains with a measure of resistance to boil smut. Selections were made from these strains for further testing and selection.

A number of crossings were made using material from sources that had shown resistance to cob-and-tassel smut and it was found that these crossings were also resistant. Material was found that has a high degree of resistance against *Diplodia*, and researchers are working on the development of techniques for testing for resistance against the entire root-rot complex.

Despite sporadic droughts in midseason the Natal Regional maize yield trials have once again indicated the high general yield potential of commercially released maize hybrids when grown at medium plant populations, i.e. about 36 000 plants per ha.

It is a feature of these results that relatively late-maturing white hybrids such as the Regops, PNR 353 and PNR 95, SR 52, S.A. 15 and certain experimental hybrids occupy top yield rankings at most of the test localities. Average top yields are expected to be over 100 bags (90 kg) per hectare, while the highest individual yield, estimated at 135 bags per hectare, was obtained at the Kokstad Research Station.

A noteworthy result in the high lysine maize breeding programme was that in chick feeding trials conducted with locally bred material the net protein utilisation rankings were highest for all the high lysine, opaque-2, maize feeds and lowest for their normal counterparts, thus confirming the superiority of protein quality in these types. In addition, the high lysine maize feeds were all ranked above normal yellow maize which was supplemented artificially at various levels with lysine and tryptothan.

A large number of strains were tested for streak infection at Vaalharts. The local intensive breeding programme has produced four promising crossings that will soon be offered for registration.

Streak is gradually increasing and cultivars such as S.A. 9 and S.S.M. 40 were the most severely infected, whereas in Pioneer 28 and D.S. 15 infection was relatively slight. However, it is by no means certain that this disease has any significant effect on yields.

Eighteen maize cultivars were tested at Sand-Vet. The cultivars D.S. 23 and 63 were among the best producers, with an average yield of 3 300 kg per ha.

Diseases and pests

Early maize plantings were small, owing to the drought conditions in the Highveld Region. These conditions also kept diseases and pests down and serious outbreaks did not occur in the early plantings.

The late plantings which carried out all over the Region were, however, affected by outbreaks. The most important organisms involved were various fungi.

In the course of a feeding trial it was shown that boil smut-infected maize is not poisonous to animals. It was demonstrated, however, that the boil smut fungus spores can pass through the digestive tract without any loss of viability.

An infection technique for use in evaluating maize breeding material for resistance to boil smut was developed and very successfully applied in the glasshouse and in the field. With the aid of this technique 90 cultivars were tested for resistance, and promising results were obtained.

Cob-and-tassel smut was fairly common. It appears that the extent of this disease is often not realised because it is taken for boil smut. A satisfactory infection technique was developed and used in the extensive evaluation of maize cultivars and breeding material for possible resistance to this disease.

Various insecticides were tested at Bethlehem against stem borers which attack maize during the early stages of development. Promising results were obtained with low-volume spraying with endosulfan, D.D.T., carbaryl molasses, monocrotophos and H.O.E. 2960 applied six weeks after the emergence of the maize.

Tillage

Maize trials in various parts of the Eastern Cape indicated that good yields can be obtained even during a year when the rainfall is below normal, provided that suitable moisture conservation and cultural practices are followed.

Exceptional maize yields of as much as 15 300 kg of grain per hectare were obtained at Alice by the Faculty of Agriculture of the University of Fort Hare in co-operation with the Eastern Cape Region, using intensive cultural practices, suitable cultivars and scientific irrigation techniques.

Weed control

Thirty-two different weedkiller treatments were tested on maize as well as on other crops in an attempt to obtain total weed control. The most promising preparations on Msinga soil were Eptam and Lasso.

Harvesting

Most of the Natal maize crop is mechanically harvested, but only the larger growers have their own combines. The bulk of the crop is picked by contractors.

Two side effects of mechanical picking are becoming evident. First, where lodging occurs, high cob losses result and figures as high as 20 per cent have been recorded. Secondly, harvesting can seldom take place when desired because of contractors' commitments so that the crop is either harvested when still moist, making artificial drying necessary or, as is usually the case, the crop is harvested late with inevitable increased lodging and delayed ploughing.

Imports and exports

During the past season 4 654 kg of maize was exported, as against 1 970 million kg the previous season.

A small quantity of maize was imported and planted under open quarantine, chiefly for research and breeding purposes.

WHEAT

Small grain research and development in South Africa were organised on the following basis during the year under review:

A *Directorate Committee* comprising the Chief Director of Crops and Pastures, the Director of the Winter Rainfall Region, the Director of the Highveld Region, the Director of the Free State Region, the Director of the Transvaal Region, the Director of the Institute for Crops and Pastures and the Director of the Botanical Research Institute, was established.

The Directorate Committee will henceforth be responsible for the planning and formulation of the national policy with regard to small grain, and will provide the guidelines for liaison and co-operation between regions and other organisations.

Working groups – Various working groups were constituted to implement various aspects of the national small grain programme as laid down by the Directorate Committee. Working groups were established for the summer rainfall area (dryland), the winter and perennial rainfall area, irrigation areas (breeding and cultivar trials) and irrigation areas (irrigation and cultivation matters). The centres designated for these working groups were Bethlehem, Stellenbosch, Roodeplaat and the Free State Region.

Action Committee – This Committee comprises the leaders of the various working groups, assisted by one officer from each of the following bodies: the Plant Protection Research Institute, the Wheat Board, and the Institute for Crops and Pastures. The Action Committee has to supply practical co-ordination, control and active leadership with regard to the national development programme as laid down by the Directorate Committee.

The Action Committee also has to take co-ordinated action with regard to the recommendations to the Directorate Committee and furnish this committee with reliable information.

Production

Wheat production in the Transvaal Region, unlike in other parts of the country, showed a drop during the 1972/73 growing season. The chief causes of this were:

1. Frost damage during the sensitive flowering stage. Wheat planted between the middle of March and the end of April was particularly hard hit by the frost damage.
2. A water shortage in the Brits area towards the end of the growing season of the late plantings.
3. Increasing damage by root fungi is being observed at Brits and on the Springbok Flats.
4. The popular cultivars Inia and Tobari are being attacked by loose smut more and more often.
5. Damage by army worms, particularly in the Rustenburg area.
6. Insufficient rains affected yields, particularly the yields of the late dryland planting on the Springbok Flats.

The chief problems experienced with dryland wheat cultivation in the Free State Region are poor moisture conservation practices, poor fertilising, stands that are too dense, and the use of fields whose potential is too low.

Owing to the poor demand for lucerne and the low prices, large areas under lucerne along the Lower Orange River were ploughed up and large portions planted to wheat. Along the Lower Orange production increased from 60 000 bags (of 90 kg) in 1971/72 to 126 000 bags last year.

Although the winter of 1972 was not ideally suited to dryland wheat production in Natal, good wheat yields were nevertheless recorded. The best planting time was mid-July and the highest yielding commercial cultivars were Frisko, K20, Barta, Bella and Betana. Yields of over 2 200 kg per ha were recorded.

In the winter of 1972 a start was made with establishing the nitrogen, phosphorus and potassium requirements of dryland wheat on the Avalon soil. There was no response to nitrogen or potassium applications, but phosphorus had a highly significant effect on yield.

From one year's results it appears that 17 ppm is the optimum level of phosphorus in the soil.

Breeding and selection

A set group of 11 local lines were crossed to a group of 12 lines from the 1969/1970/1971 International Spring Wheat Rust Nursery (I.S.W.R.N.) as well as to 5 promising local lines. Where possible crosses in all combinations were performed, resulting in 140 new F1 lines. Twelve I.S.W.R.N. lines were included because of their high measure of rust resistance, as well as their promising yielding ability.

The back-crossing programme with Flameks, Skemer and Kasteel, initiated in 1970 to incorporate rust resistant and short straw genes from various sources, has currently progressed to the third back-cross generation. Approximately 1 900 lines are involved in this facet of the programme.

International Spring Wheat Rust Nursery (I.S.W.R.N.)

The I.S.W.R.N. programme still makes a substantial contribution to the local breeding effort, especially as far as breeding parents are concerned. But as far as direct releases of these lines are concerned it is interesting to mention that of the 12 000 entries received in the past 20 years, only three have been directly released as varieties, viz K20, Janitor and Lee Mida.

Quality tests

The Wheat Control Board is now undertaking all quality testing of pure lines. This year 1 057 pure lines have been submitted for quality evaluation.

Of the 120 pure lines evaluated in replicated trials at two localities in the past season, 20 have been nominated for testing in the elite or co-operative trials of the Agronomy Department of the University of Stellenbosch.

New releases

Two lines, W8 and W15, have been nominated for release. Quality tests and multiplication of these two lines are being undertaken.

Durum programme

The main emphasis in this programme was directed towards an evaluation of new introductions and the crosses made in previous years.

Interspecies crosses

Triticale cathlicum and *T. sphaerococcum* were found to cross readily with rye and can be used to transfer rye genes to triticale. Gamma irradiation of triticale and rye pollen enhances their crossability with common wheat.

An elite trial was planted at 10 different spots in the Winter Rainfall Region. There were 64 entries in this trial, the purpose of which was to evaluate locally bred strains, strains from other sources, and imported material, for adaptability with regard to yield and quality in that Region.

The two locally bred strains W8, whose performance was above the average for the trial in 4 places, and W15, which exceeded the average at 7 places, were selected for multiplication and possible release.

A series of *cultivar trials* were sown in 15 sub-ecological areas. There were 21 entries for each trial. The purpose of this trial is to introduce and evaluate a certain group of cultivars, chosen from the existing released cultivars, for each sub-ecological area.

In the Swartland the following cultivars gave the best and second best performances:

		Bags per ha		Bags per ha
Porterville	Zambezi	46,8	Tosca	45,3
Malmesbury	Inia	42,4	Lexmo Rojo	35,8
Pools (dry area)	Lee Mida	14,7	Inia	12,7

In the South-Western Districts and the Rûens area the performance figures were:

		Bags per ha		Bags per ha
Riversdale	Tosca	46,5	Zambezi	42,3
Caledon	Janitor	29,7	Lee Mida	29,6
Swellendam	Zambezi	16,6	Lee Mida	15,9

Segregating material

During the past season 1 156 second and fourth generation lines were developed, and 81 advanced lines were sent to the Wheat Control Board for macaroni quality tests.

Triticale programme

The local triticale programme is being directed towards the achievement of a dual purpose crop, viz grain and hay.

In a trial at the Outeniqua Research Station in which 41 cultivars and strains were compared, several new strains seemed very promising even though the season was relatively dry. The cultivars Zambezi and Tobari, which had already been released, did not do very well. Inia (6th place) and Ciano (9th place) were the exceptions.

Inia and Tosca performed best of the long-straw cultivars, with yields of 34,91 and 27,01 bags per ha respectively; short-straw varieties were also used as standards here. Inia and Tosca were followed by Janitor, Lee Mida, Kasteel and Gamenya with yields of between 20 and 22 bags per ha. K20 was badly affected by the dry season and produced a low yield.

A long-straw cultivar trial that included 29 entries was planted at the Oudtshoorn Experimental Farm. W14 with 62,2 bags per ha produced the highest yield; Tosca produced 60,9 bags per ha, W15 produced 57,6 bags per ha and Flameks and Raven 56,6 bags per ha each. W14 and W15 could therefore possibly be released for this area. Unlike the other cultivars, W14 showed no rust infection.

A short-straw cultivar trial, with higher fertilisation than for the ordinary long-straw cultivars, was established under irrigation. The strain 10 246, with a leaf rust reading of 10 and no stem rust, produced the highest yield, viz 59,4 bags per ha. Inia produced 55,8 bags and Mtilikwe 55,0 bags per ha.

A trial with 33 entries was established on the Langkloof Experimental Farm. The cultivars which did best there were Zambezi with 28,9 bags per ha, Hoopvol with 27,4 bags per ha, W15 with 26,3 bags per ha and Raven with 25,0 bags per ha.

A cultivar trial at Uniondale, in the dry part of the region, produced the following yield: T4 – 22,0 bags per ha, Gamenya – 20,5 bags per ha, Hoopvol – 20,3 bags per ha and T8 – 20,2 bags per ha; these were the highest yields.

It was established at Roodeplaat during the 1972/73 season that 7 breeding strains yield well, and have higher resistance to disease and good baking quality. These 7 cultivars were again included in nation-wide yield trials (11 localities), as well as in three strip trials in the Transvaal Region and in a trial in Mozambique and Swaziland.

Exceptionally high grain yields were obtained on the Vaalharts and the Sandvet Experimental Farms from a wide range of wheat cultivars, the best of which were T4 and T8 with about 7 300 kg per ha.

Locally bred cultivars seemed promising with regard to grain yield. If their baking quality is also good, these cultivars could serve as replacements for the present Class A cultivars such as Inia 66 and Zambezi, which have several inherent weaknesses.

Although the yield from irrigated wheat cultivars did not differ significantly in trials at Hardap, South West Africa, the good germinators as a group did produce significantly better yields than the poor germinators as a group. However, when the good germinators were placed in order according to yield, the order was not the same as during the germination studies.

Dryland cultivars that germinated well under saline conditions showed that they did not have the yield potential to compete with short-straw cultivars under irrigation. The cultivars T4, Tobari, Punjab, Sebakwe, Inia and Tokwe produced well.

Seed multiplication

Seed multiplication is an integral part of the entire breeding, evaluation and release programme for wheat.

At present 76 strains are being multiplied for inclusion in trials or for possible release of some of the strains. 14 bags of basic seed of new cultivars were delivered to the Wheat Board. This seed is used for the production of certified seed.

Planting methods

The following combinations of row espacement and planting density, as determined at Vaalharts and Sandvet, have been found best for the cultivars T4 and Inia under irrigation:

T4 planted in 15 cm rows with 80 kg of seed per hectare
T4 planted in 15 cm rows with 120 kg of seed per hectare
T4 planted in 30 cm rows with 160 kg of seed per hectare
T4 planted in 30 cm rows with 80 kg of seed per hectare
Inia planted in 15 cm rows with 120 kg of seed per hectare
Inia planted in 15 cm rows with 160 kg of seed per hectare
Inia planted in 30 cm rows with 160 kg of seed per hectare
Inia planted in 15 cm rows with 80 kg of seed per hectare

With row espacements of 45 cm and 60 cm wheat-grain yields dropped significantly under irrigation.

The use of a press-wheel planter on the Riet River Experimental Farm resulted in a 20 per cent better stand at 6 weeks after emergence than the method of planting wheat in dry ground and then irrigating it – i.e. irrigating immediately after planting.

The press-wheel method also had the following advantages: fewer cultivations, and a reduction of at least one application of 75 mm in the number of irrigations needed.

Cultivation

Owing to the serious driftsand problem in the wheat-producing areas between Mossel Bay and George, a trial was laid out at Outeniqua to test the possibility of applying no cultivation.

A stubble field was sprayed with the weed-killers gamoxone and reglone and the wheat was then sown directly in drills, without disturbing the soil. The development of the wheat was quite normal and the yield slightly higher when no cultivation was applied. However, this method will have to be investigated further before it can be recommended.

Fertilising

It was found at Vaalharts and Sandvet that the best nitrogen levels for the cultivars T4 and Inia on soils of the Mangano Series (Hutton Form) is 160 kg of nitrogen per ha, and that 110 kg of nitrogen per ha is best on soils of the Shorrock Series (Hutton Form).

Optimum levels are about 130 kg and 80 kg of nitrogen per hectare respectively.

Fertilising trials with wheat in the Karoo region showed that a good response is obtained when enough nitrogen and phosphate fertilisation is applied.

In the Fish River Valley it was found that it is essential to apply agricultural gypsum on alkaline and brack soils. Increases of 10 bags (70 kg each) were obtained in the yield per hectare with an application of three metric tons of agricultural gypsum per hectare.

Irrigation

It was found in the course of trials in the Free State Region that wheat can be irrigated six weeks after planting, as soon as 100 mm has evaporated from a Class A evaporation pan. This means 8 irrigations of 75 mm each during the season. This method compares well with the method of irrigating wheat according to the critical growing stage, and has the advantage that planning can be more orderly.

Weed control

A trial was laid out at the Welgevallen Experimental Farm to evaluate the effect of various weedicides on the control of broad-leaved weeds in wheat. There was a difference between yields from the `controlled plot and from the treated plot: the latter producing 800 kg per ha more on the average.

Diseases

This year a serious soil-borne disease was again observed in wheat on the Springbok Flats and in other wheat-producing areas. In the majority of the cases the pathogen was a *Rhizoctonia* sp., but *Ophiobolus graminis* and *Fusarium oxysporum* were also observed, although the former was restricted to one place in the Brits district.

Chemical control with standard seed treatment preparations appears to be fairly successful against *Rhizoctonia* in some cases. Some of the new seed treatment preparations submitted for registration also produced excellent results.

Pests

Trials for determining the economic importance of the three aphids *Schizaphis graminum, Acyrthrosiphon dirhodum* and *Macrosiphum avenae* on irrigated wheat were undertaken at the Tobacco Research Institute at Kroondal, Rustenburg, during the winter of 1972. No statistical differences in grain yield and bushel weight, which might indicate that spraying for aphids is economically justified, were obtained.

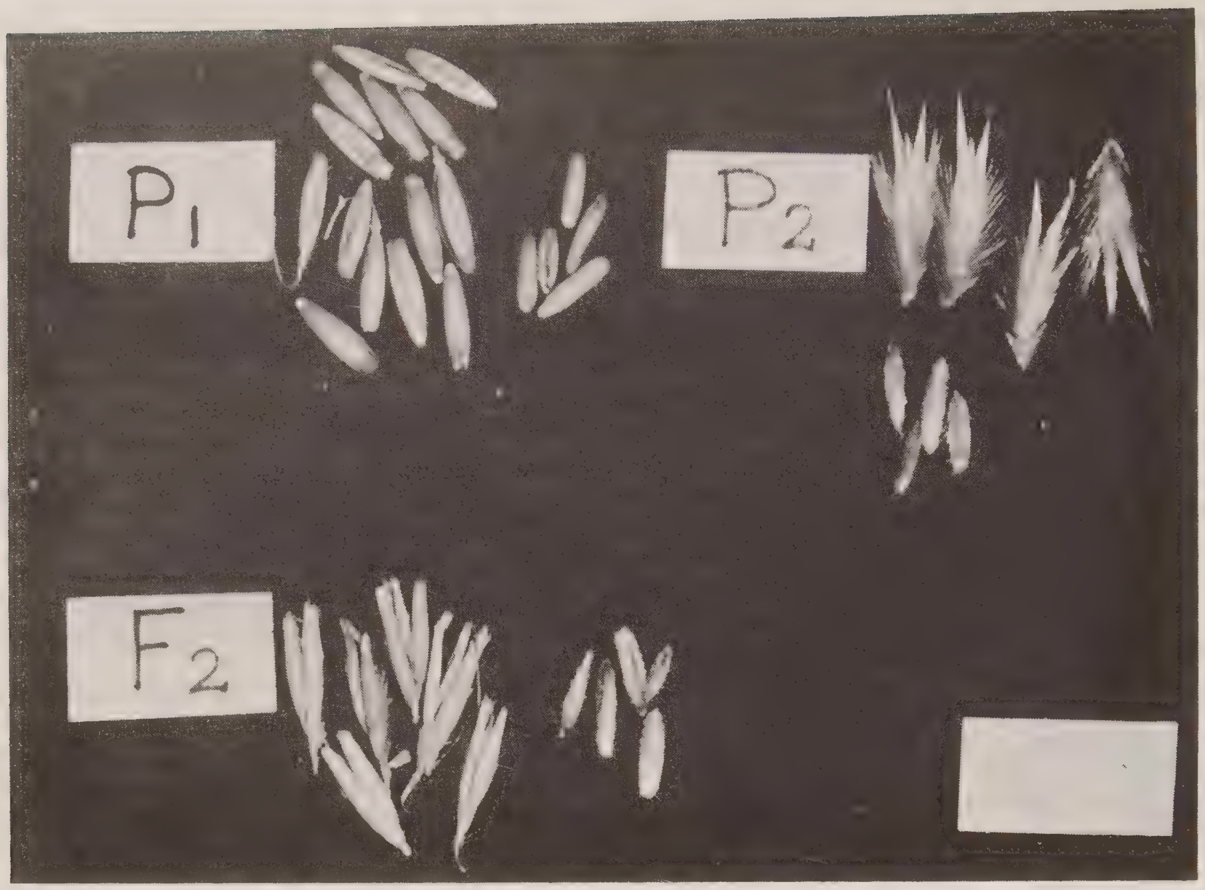
Trials were carried out at the Towoomba Research Station to determine the effectiveness of disulfoton 5 per cent granules applied in soil during planting in the control of the aphid *Melanaphis sacchari.* On both black turf and red loam significant aphid control was obtained throughout the season at 0,5, 1,0 and 1,5 kg of the active ingredient disulfoton per hectare.

Feeding trials with the two tortoise beetles *Chilomenes propinqua* and *Scymnus morelleti* indicate that there is a positive correlation between oviposition and the quantity of food eaten during the larval development of the female.

The bollworm *Heliothis armigera* occurred in pest numbers in the Winter Rainfall Region for the first time in 1967, and reached a climax in October 1972. Wheat and lupins in the Swartland and surrounding districts and wheat in the South-Western and Southern Cape districts were damaged.

The green wheat bug *Blissus diplopterus* occurred in pest numbers on small grain in some of the grain-producing parts of the Winter Rainfall Region. Control measures had to be applied against the insect at Eendekuil.

There are two types of aphids that attack wheat under irrigation at Vaalharts. They are the green aphid



Crosses between wild oats and cultivated oats, showing segregation of seed types

Acyrthrosiphon dirhodum and the brown wheat aphid *Macrosiphum avenae.* The infestation generally reaches a peak towards the middle of October.

It was found last season at the Vaalharts Research Station that these two wheat aphids together can cause an average crop loss of up to 27 per cent.

The green aphids found under dryland conditions in the Free State Region were identified as *Schizaphis graminum,* which is not the same species as the one that occurs under irrigation.

Laboratory trials also proved that systemic preparations keep the wheat plants free of aphids for about 10 days.

OATS

As a result of the higher meat and wool prices there has been a great increase in the area in the Karoo Region planted to oats and used for green fodder. The chief problem was to obtain sufficient seed of the right cultivars.

In general producers are not yet giving the pastures enough nitrogen fertilisation for maximum production.

A large number of oat cultivars and strains were tested at Vaalharts during the past season. The best grain producer was the cultivar Alaska, with a yield of 5 600 kg of seed per hectare. This cultivar's hay yield was also fairly high.

Under the short-season growing conditions which characterised the Swartland during 1972 the early cultivars Swan and Irwin gave the best yields in spite of their susceptibility to crown and stem rust. According to yield trial results they yielded approximately 3 000 kg per ha as opposed to the yield of the standard, Anita, which was 2 600 kg.

Oats were also seeded late in the South-Western coastal region, but the higher incidence of disease as well as climatic factors eliminated the above-mentioned cultivars and brought Fla. 500, Fla. 501, 1330–3–8B–1, 1367–85–3 and 1366–53 into prominence.

In general Fla. 500 and Fla. 501 performed outstandingly well as far as grain production in the South-Western area is concerned.

Because rye grass is one of the chief sources of winter grazing in the George-Knysna coastal area and it is regarded as an impurity if wheat is sown in the fields after grazing, efforts are being made to find a type of oats that is palatable and produces evenly throughout the growing season.

For this purpose a trial with 15 oat cultivars and strains was started at the Outeniqua Experimental Farm. Of the cultivars already released, Sonja, Abundance and Neosho showed good initial growth. At the first cutting these three and a promising Ranger strain all produced more than the average for the trial.

Heros, Jongensklip and a new strain H66/91 all recovered quickly and showed an even growth pattern throughout the season. Heros and H66/91 produced a good second cut. H66/91 showed sustained production and its production at the last cut, at the end of the season, was better than that of Ranger or Heros.

Rust readings taken just before the last cutting showed that Heros and Jongensklip were more severely infected at that stage than Ranger.

Seed production was extremely poor from all the strains and cultivars, and no cultivar can be recommended for any purpose other than grazing at this stage.

An elite oat trial was carried out at seven places in the Winter Rainfall Region in 1972.

It was deduced from the trials that there are three very promising strains that may possibly qualify for release shortly. One strain in particular, Fla. 501, finished among the top three in six of the seven trials.

Small quantities of oat seed are being multiplied at Elsenburg, chiefly different strains, and larger quantities were sown on the Langgewens and Tygerhoek Experimental Farms. This year 18 strains are being multiplied and in 1972 24 bags of basic seed were supplied to the Wheat Board. In addition to this seed, a considerable quantity of seed is being multiplied in preparation for the release of a new strain.

BARLEY

The production of barley has decreased gradually since 1953 and at present it is about 13 000 metric tons a year. Consequently there is a shortage of barley for brewing purposes, and almost 50 per cent of requirements have to be imported.

Trials with various cultivars and breeding strains in the Fish River Valley showed that there is great potential for the production of brewers' barley in this area.

Identical lines grown in yield trials at Tygerpoort and Langgewens indicate that a number of 2-row lines yield as well as the 6-row line 46/76–1–6. The latter is particularly well adapted in both regions. Lines 60/19–58 and 60/19–30A give higher yields than the standard 2-row cultivar Swanneck in both areas.

Some 121 pure lines were tested under irrigation conditions at the Cradock experimental plots in the Karoo Region. Yields of the 6-row cultivars Comma and Elses were 3 800 kg and 3 000 kg per ha respectively while that of Swanneck was 2 900 kg per ha. In comparison, some of the new lines show considerable promise of improved yield, especially that of the 2-row line 60/13/–1–3 which gave 4 100 kg per ha.

Excellent results in the control of powdery mildew on barley and wheat in the glasshouse were obtained with the application of the chemical Ethirimol to the soil. No phytotoxic effects could be observed in either crop, although the effects were evidently longer lasting in barley than in wheat.

RYE

After successful yields by private collaborators and in trials, the cultivar Weser was released in 1971. It has a good stooling capacity, a strong straw and is leafy, but is susceptible to stem rust. Owing to this last-mentioned character it was decided that another rye cultivar should be made available as soon as possible.

Maroc, a European cultivar, was considered for release and was accepted by the Wheat Board in March 1973. Like Weser, it is fairly early and is well adapted to the Sandveld of the West Coast. Furthermore, it has a strong straw of average length and a fair stooling capacity. It is fairly resistant to leaf rust.

Immediately after the release 31 bags of seed were supplied to co-operatives in the areas concerned.

Maroc was the only cultivar released in 1972.

GRAIN SORGHUM

Research on the grain sorghum stem caterpillar *Chilo partellus* Swinhoe was continued and particular

Rhynchosporium on barley

attention was given to possible chemical control measures. Several poisons were used, but spraying had little effect on the insect. The most effective control was spraying with carbaryl (50 per cent wettable powder) at 1 200 g per hectare.

The overlapping of generations was probably responsible for the high post-spraying survival rate.

Stem borer infestation in grain sorghum was again high and infestations of up to 95 per cent were recorded.

On the Springbok Flats sorghum plants affected by downy mildew were found in the Lehau–Settlers–Nutfield area with an incidence from 1 to 25 per cent of diseased plants in individual fields. *Sclerospora sorghi* was the species of downy mildew fungus present on diseased plants.

COTTON

Excellent crops were obtained on the irrigated soils at Vaalharts.

Along the Lower Orange River accumulated lucerne stocks and the consequiently low prices led to lucerne being replaced by cotton in many fields. Consequently production rose from 15 000 bales of 170 kg each in the 1971/72 season to 50 000 bales in the 1972/73 season.

In the Transvaal Region, the Loskop area has been chosen as the centre for cotton research in order to keep pace with the switch from dryland areas to irrigated areas in cotton cultivation. Problems in the dryland areas will still receive the necessary attention, however, and the centralisation of the research team should be of benefit to these areas as well.

Breeding and selection

The climate during the past season was very suitable for cotton production, although *Verticillium* wilt was fairly severe.

In the trials along the Lower Orange River the new selection 68/1/5 C-2 did best, although its yield was not significantly higher, statistically speaking, than that of 68/4/21. Selection 68/1/19 G-2 also did very well as regards yield, but it cannot be regarded as pure enough to be released as a cultivar. On the other hand CA, the cultivar that is grown extensively in that area at present, did worst as far as yield is concerned. Its yield was also significantly lower, statistically speaking, than the yields of the other entries, with the exception of Del Cerro 153.

The said high yields from the cultivars and selections were accompanied by undesirably high micronaire values of the fibre. The normal variation for CA is about 3,6 to 4,0 but values of as high as 4,8 were obtained during the past season. A number of new selections are very promising, particularly those that had 68/4/21 and Acala SJ-1 as parents.

Acala SJ-1 seems to be the only promising breeding parent at present whose progeny shows a fair degree of tolerance for *Verticillium* wilt as well as red-leaf disease ("rooidood").

In a yield trial at Vaalharts 68/4/21 produced the highest yield of seed cotton, viz 5 364 kg per ha, followed by 70/157 and 70/92, two new selections which were developed with a view to resistance against *Xanthomonas*. In this trial CA and Acala 1517 BR (the so-called CAB) produced the lowest seed cotton yields.

At the Riet River Research Station CA produced the highest seed cotton yield, viz 5 371 kg per ha, although this was not significantly higher than the yields of 68/1/5 C-2, 68/4/21 and Acala SJ-1. Here, too, the performance of Acala 1517 BR was rather poor. Application has already been made for the release of 68/4/21.

Fertilising and rotational cropping

In the course of trials at Vaalharts and Sand-Vet it was found that the optimum nitrogen level for cotton was 90 kg to 110 kg of nitrogen per hectare. Higher applications of nitrogen only delay the maturation process, with the result that the major portion of the crop is harvested at a later stage and is then of poorer quality.

With regard to irrigation, it was found that the best results are obtained by irrigating cotton, from 6 weeks after planting, each time as soon as 125 mm has evaporated from an American class A evaporation pan.

In a rotational cropping trial it was found that cotton can be grown under monoculture for 4 years without this having any significant effect on the yield.

Pest control

Trials on the control of thrips at Vaalharts showed that preventive control measures (systemic seed treatment or granules) produce significantly better results than no treatment, but are not the best solution, owing to the irregular incidence of thrips infestations. Corrective control is more valuable since young, damaged plants recover very quickly.

Five light traps in the Vaalharts area gave indications of *Heliothis armigera* flights; peaks may be expected in December and January.

The first stage of *H. armigera* was exposed to 29 new insecticides in the laboratory. Apart from the recommended preparations endosulfan and carbaryl, three preparations are promising enough to be tested further in field trials.

Owing to the exceptionally dry season *H. armigera* infestations reached a peak later than usual (February–March) and *Disparopsis castanea* reached a peak in March on an unsprayed plot at Rust de Winter. The dominant egg parasite of *H. armigera* was a *Telenemus* sp. this season. The previous season it was a *Trichogrammatoidea* sp. It appears that *Chrysopa zastrowi*, *C. pudica* and *C. congrua* occur in cotton fields as predators. The value of these three species will be determined. During the past season experiments were carried out, chiefly with *C. zastrowi*.

Laboratory experiments showed that *C. zastrowi* needs at least 25 *H. armigera* eggs a day to complete its life cycle normally and one individual ate a maximum of 183 eggs a day.

Imports

As against the 30,5 million kg imported last year, 45,5 million kg of cotton was imported during the year under review.

GROUNDNUTS

The low and poorly distributed rainfall resulted in low seed yields of poor quality.

The high populations of harmful soil fungi, the result of groundnut monoculture, caused large-scale destruction of the drought-weakened plants.

Poor stands resulted in serious rosette virus infection in the Northern Transvaal and Northern Cape.

Groundnut production in the Highveld Region has dropped by about 30 to 40 per cent in comparison with the previous season. In the western part of the Region only about 50 per cent of the normal area was planted.

The cultivation of groundnuts on dryland in the Central Free State has virtually ceased. The area under irrigation increased by about 50 per cent, chiefly as a result of the development of vacant plots during the previous year.

Among the chief problems experienced there are declining production owing to leaf spot, compaction of the soil and possibly unbalanced fertilising.

The mechanical lifting and drying of groundnuts at Vaalharts is being increased in order to solve the labour problems. Driers have also been used successfully for the past few years.

Despite the poor season, yields in Natal were satisfactory. Large-scale planting of groundnuts following recommendations based on experimental results yielded 2 400 kg of unshelled nuts per ha.

Breeding and selection

A number of new strains were tested for the first time in yield trials in the Highveld Region. Two of them did outstandingly well under irrigation at Vaalharts. The first is a Natal Common type, which showed an increase of 30 per cent in yield and a much better grading. The second is a cocktail type that ripens well at Vaalharts and yields fairly well.

The cocktail type has to be investigated further, but it appears that it will be possible to produce cocktail nuts at Vaalharts and similar places.

Large-scale selection under irrigation and also on dryland showed that mainly the quality of groundnuts can be improved considerably by breeding.

Irrigation

The importance of good moisture provision for groundnuts under irrigation is underlined by the marked differences found between various irrigation treatments. The optimal irrigation level apparently has somewhere between the evaporation rates of 50 and 100 mm, at which level the kernel yield is 4 000 kg per ha.

Shelling percentages are evidently not drastically affected by the various irrigation levels.

Fertilising

On sandy soils at Dundee severe calcium and boron deficiencies have been observed in groundnut kernels. This results in very poor groundnut quality.

At this stage it appears that these problems can be greatly alleviated by the application of gypsum.

Harvesting

The mechanisation of the harvesting process for groundnuts is advancing rapidly in South Africa at present. Various lift pickers were purchased by producers during the past season.

Considerable progress is being made in the development of mechanical harvesting and drying techniques for use under local conditions.

SUNFLOWER SEED

The very important part sunflower seed plays in South African agriculture was again demonstrated during the year under review. Owing to the very late and often inadequate rains, there were many places where maize could not be planted. The late rains were still in time to make record sunflower plantings possible, however.

In many cases sunflower seed was the only cash crop from which any income was derived. This crop did very well on the "traditional" maize soils. However, early frost impaired the crop a great deal.

In the Central Free State sunflower production has increased considerably this year, particularly on wheat lands where root diseases and wild oats occur. In most cases fair yields were obtained. This crop is expected to be grown at the expense of maize to an increasing extent during the coming season.

Owing to the expected rise in oilseed prices, there was keen interest in sunflower planting on irrigated soils at Vaalharts.

It was found on the trial plot at Cradock in the Fish River Valley that sunflowers can be successfully grown as an intercrop with wheat. There is a great deal of interest in the production of sunflowers in this area and there is every indication that the crop will be grown on a large scale in the valley in future.

During the year under review good progress was made with the breeding programme in the Highveld

Sunflower is a promising crop in the Fish River Valley. The photograph shows plantings in cultivar trials on the Cradock Experimental Plot

Region and it was possible to produce two generations during the summer season.

Breeding with open-pollinated cultivars holds considerable promise for rapid progress and enough seed of the new selections was obtained for a comparative trial during the coming season.

Results obtained with experimental hybrids from France (in a co-operative programme with the INRA) point to considerable possibilities for improvement through the use of hybrid seed.

Valuable new material was obtained from overseas sources for inclusion in the local programme.

At Dundee in a cultivar trial the low-oil cultivar Kort Rus yielded 2 900 kg of seed per ha, which was over 1 000 kg per ha higher than the better high-oil cultivars.

During the year under review it was found at the Nooitgedacht Research Station that later plantings did better than earlier ones. Drought at flowering time may possible have been responsible for this.

Damage to sunflowers by *Protostrophus* weevils occurred on the Springbok Flats. Good control was obtained by planting the seed with dieldrin.

At the Nooitgedacht Research Station Lasso and Eptam gave good control over a broad spectrum of weeds, with little damage to sunflowers.

SOYA-BEANS

Poor crops in the chief soya-bean producing countries of the world have created an exceptionally keen demand for soya-beans on world markets. The shortage of proteins for use in stock feed mixtures has made the demand for soya-beans rise to an unusually high level in South Africa as well, and unprecedented prices are at present being offered for soya-beans.

These favourable prices are creating a very keen interest in the production of soya-beans, but during the 1973/74 season plantings will be limited owing to insufficient seed supplies. A marked increase in production cannot be expected before 1974/75, provided the relatively favourable prices are maintained.

The first planting of soya-beans under irrigation in the Karoo Region produced average seed yields. It is expected that with improved production techniques and more experience this crop will combine well with the production systems under irrigation in the Fish River Valley.

Remarkably good yields of soya-beans were produced at Dohne in spite of the exceptionally low summer rainfall. The cultivar Geduld produced the highest yield of 2 300 kg of good quality grain per ha.

Despite an unfavourable season soya grain yields obtained at Dundee, Cedara and Kokstad were very good. The highest yields, approximately 4 000 kg per ha, were obtained at Kokstad.

Soya-bean breeding in the Highveld Region has been discontinued became the existing cultivars appear to be no longer suitable. In the mean time the germ plasm of 500 strains will be preserved by means of triennial planting and cold storage. Agronomic research and classification are being continued with the existing material.

DRY BEANS

Unfavourable climatic conditions resulted in a small dry bean crop, and exceptionally high prices are being obtained for all types of dry beans.

In the Karoo Region small areas were planted to dry beans, chiefly the Michigan varieties. The yields from spring plantings were low as a result of the dry, hot summer months.

Plantings during January generally yielded better and showed that dry beans can be successfully included as a short-season crop, between the normal wheat crops.

The breeding of small white dry bean cultivars for canning purposes has reached the stage where the first pure strains from the breeding programme can be multiplied for testing in yield trials.

Seed of 103 strains selected for early (spring) planting and 58 strains for late (January) planting is at present being multiplied at Makatini. The plantings during the past season again showed that the disease complexes to which the early and late plantings are subject differ a great deal. It will therefore probably be necessary to develop two types of cultivar, one for early and one for late planting.

In a dry bean cultivar trial at the Upington Agricultural Research Station, Tepary produced the highest yield, viz 1 690 kg per ha. The yield from this cultivar was almost twice as high as that from White Dutch Princess, which produced the second highest yield.

Fourteen different dry bean cultivars were evaluated under irrigation at Sand-Vet, using different planting dates. Four of these cultivars did fairly well at planting dates round the end of October and the beginning of January, and seed yields of from 1 450 to 2 000 kg of seed per ha were obtained.

The housewife is no longer interested in preparing dry beans, owing to the long cooking time required. Ways of making it possible to produce a product that requires a short cooking time were investigated at the Fruit and Fruit Technology Research Institute, first on a laboratory scale and later on an experimental factory scale. The product need not be soaked beforehand at all, and takes only 15 minutes to cook.

ARTIFICIAL PASTURES AND FORAGE CROPS

LUCERNE

Results from two experiments at Kokstad Research Station have shown that lucerne can be profitably produced under dryland conditions on both the Doveton and Southwold soil series. Both these soil types occur commonly in Griqualand East.

The total yields obtained over a four year period were 29 tons dry matter per ha on the Southwold series and 26 tons per ha on the Doveton at an estimated production cost of approximately R14 per ton.

These results were achieved where high levels of lime, 6 tons per ha, and 2 tons of superphosphate had been applied per ha before establishment of the crop.

All told, 23 new lucerne breeding strains were tested for resistance against bacterial wilt caused by *Corynebacterium insidiosum*. So far 14 breeding strains have passed the test and been sent to the lucerne breeding centre at Grootfontein.

Research into crown and root rot of lucerne revealed that infection takes place more readily in heavy clay soils that are poorly drained.

It should be possible to obtain fair control of this disease if the fields are well drained and sufficient potassium and calcium are available.

The multiplication of the basic seed of the new lucerne cultivar Karoo 70 for irrigation areas was continued. This cultivar is at present being evaluated in large plantings in various places.

The leaf disease that was responsible for the defoliation of lucerne during the cold, damp conditions in the high-rainfall areas of the Eastern Cape has been identified. The pathogen is the fungus *Leptospaerulina briosiana.*

The lucerne earth flea *Sminthurus viridis* and the black sand mite *Halotydeus destructor* remain the most important pests on artificial lucerne pastures in the Winter Rainfall Region.

Good progress was made with the biological control of these pests. The lucerne earth flea predator *Bdellodes lapidaria* is already well established at Caledon. Large numbers are available there and general release and establishment of the mite can be undertaken. The artificial distribution of the predator will be necessary owing to the slow natural spread of the mite.

Regular surveys in the trial plots at Caledon showed that a drop in lucerne flea numbers is related to an increase in predator numbers.

Neomolgus capillatus, another predator mite of the lucerne earth flea, has made fairly good progress.

The progress of the black sand mite predator *Anystis* sp., which was imported from Australia in 1971, shows that this predator quickly adapts to changed climatic conditions.

LUCERNE AND GRASS MIXTURES

During the first year of a grazing trial at Riviersonderend a lucerne-grass-clover-medic pasture carried four sheep and their lambs throughout the year, with very little supplementary feeding during the summer months.

In a grazing trial at Riviersonderend the clovers and medics did not become very well established in lucerne-grass mixtures on soil where lucerne had been grown the previous year and which consequently had a high nitrogen content. The grass tends to dominate the clovers and medics.

CLOVER

Since the soils of the chief grain-producing areas are generally fairly sour, it is important, particularly for the establishment of the annual *Medicago* species, to determine the exact lime requirements of these crops. With a view to this *M. truncatula, Trifolium subterraneum* and *T. hirtum* were established on plots of greatly varying acidity at Tygerhoek.

It appeared that the shaly soils of the trial site can ensure good crops of these species with relatively low lime applications.

At Langgewens the season was very dry. Under these conditions the subterranean clover *Trifolium subterraneum* did not do nearly so well as the annual *Medicago* species and the more drought-resistant clovers such as *T. hirtum, T. cherleri* and *T. spumosum.* An early cultivar of *T. cherleri,* Beenong, appeared to be very promising as regards both hay and seed yield.

Two new *Medicago truncatula* acquisitions, viz. Cyfield and Borung, were tested for the first time but did not do better than the existing cultivars. Borung is a fairly late cultivar and produced a rather poor seed crop. The seed crops from subterranean clover did not compare well with those from the species with better drought resistance.

The seed crop from *T. spumosum,* about 1 400 kg per ha, was by far the best.

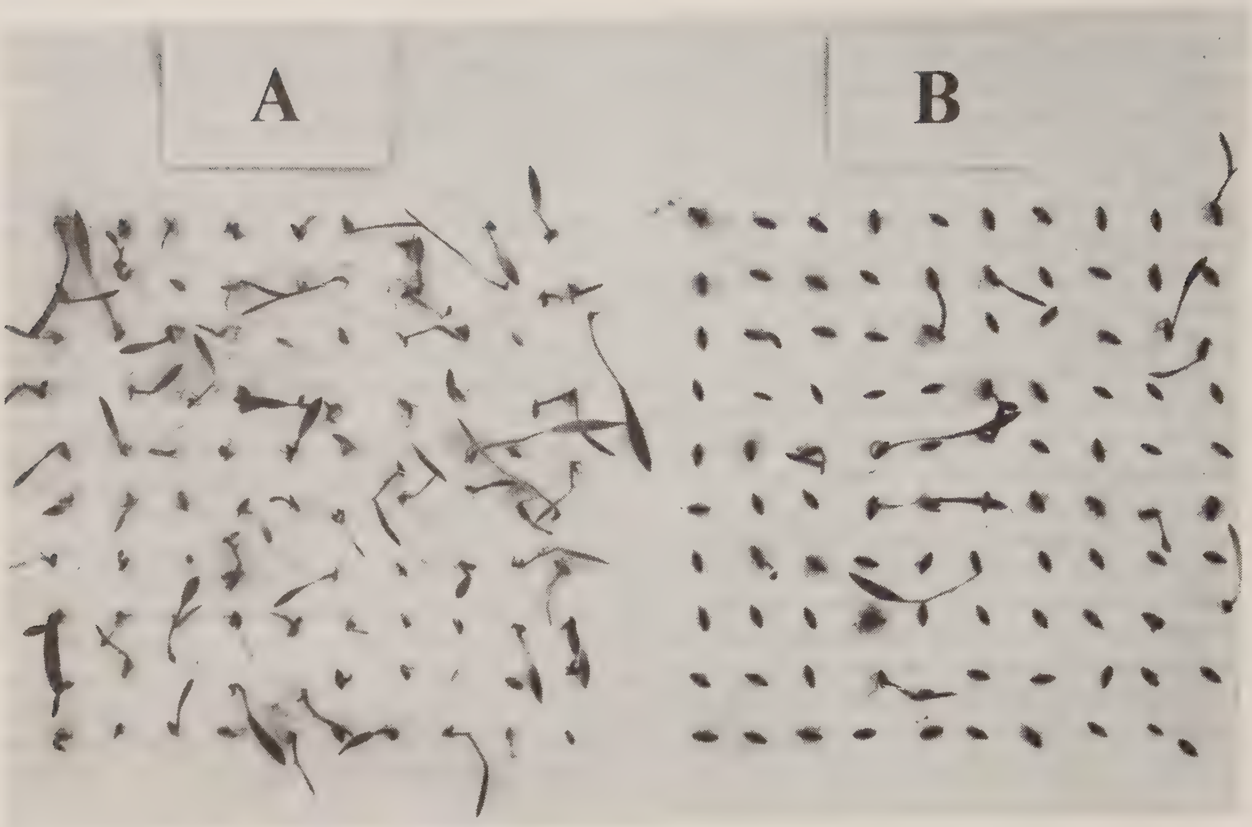
In a trial at Bredasdorp new rose clover *Trifolium hirtum* entries showed a significantly higher dry matter yield than the Kondinim cultivar and the subterranean clover and medic cultivars.

At Rûens (Riviersonderend) the rose clover *T. hirtum* made a good showing. The yields from *T. clypeatum* and the subterranean clovers Mt. Barker and Clare were also fairly good. The medics produced a low dry mass and good seed yields. *T. spumosum* produced the best seed crop in the Swartland and the Rûens.

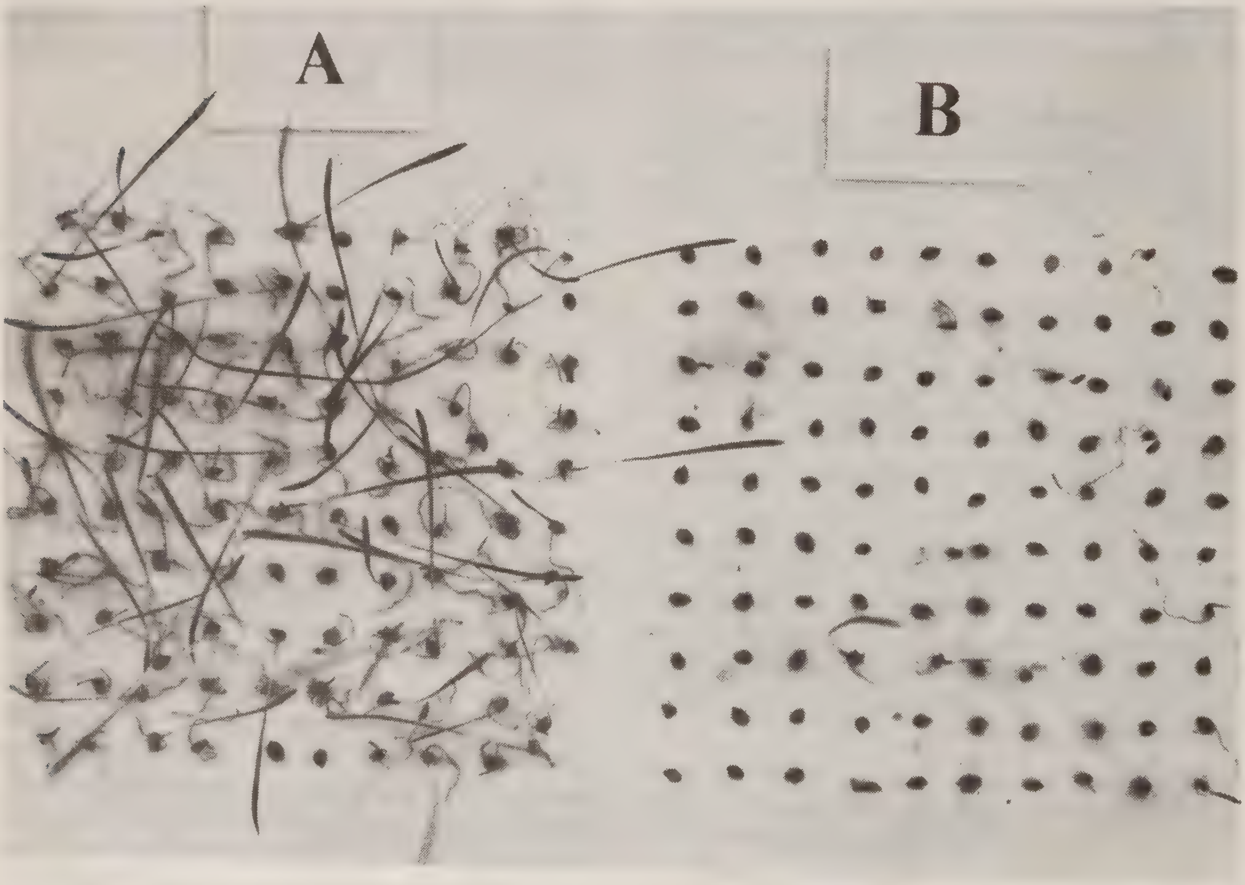
LUPINS

The results of an advanced study showed that the lupin cultivar *Lupinus albus* is very susceptible to the fungus disease *Phomopsis leptostromiformis,* whereas *L. angustifolius* and *L. luteus* are less susceptible. *L. mutabilis* is more or less resistant.

Since the leaf spot fungus also causes lupinosis and conditions throughout the year are favourable for the development of this fungus, it is recommended that *L. albus* should not be grown where lupinosis is a problem. Preference should be given to the *L. angustifolius* and *L. luteus* cultivars, but where these species are used as a pasture crop in stubble form, grazing control should be carefully applied.



Removal of the palea and lemma in seed of Nile grass *Acroceras macrum* (A) results in a considerable increase in germination compared to uncleaned seed (B)



The seed germination of Cedara-bred *Paspalum dilatatum* (A) is considerably superior to that of the ordinary commercial type

ERAGROSTIS CURVULA

It was found at the Bethlehem Research Station that each increment in fertilisers (from 0 to 106 kg of nitrogen and 32 kg of phosphate per ha) caused a highly significant increase in hay production, nitrogen percentage, crude protein production and fibre production in *E. curvula,* together with a drop in soil moisture content and moisture content.

The defoliation of *E. curvula* during July, August or September had no significant effect on any of these treatments.

The plots that were cut each year produced more hay than those that were burnt annually, and plots burnt every two years also yielded better than those burnt annually.

E. curvula burnt annually had a higher nitrogen content than grass burnt every two years. On the other hand, the latter contained more nitrogen than *E. curvula* cut annually.

The moisture content of *E. curvula* cut annually was higher than that of the *E. curvula* that was burnt. The soil moisture content of plots burnt annually was lower than that of plots burnt every two years and plots cut annually.

BUFFALO GRASS

Studies have shown that the buffalo grass *Panicum maximum* cultivar Sabi planted in ½ m rows, with or without subtropical legumes, produced good hay yields of 16,5 metric tons per ha in two cuts under dryland conditions on a red clay loam soil at the Barberton Research Station.

In ½ m rows with the *Panicum maximum* cultivar Sabi at Barberton, the exotic subtropical legume *Phaseolus atropurpureus* siratro did best and *Desmodium intortum* (greenleaf) did second best with regard to the production of dry matter and establishment; both performed better than *Glycine javanica, Desmodium uncinatum, Lotononis bainesii, Stylosanthes guyanensis* (stylo) and *S. fruticosa.* Siratro appears to be the most promising perennial legume for forage.

The *Lolium perenne* x *L. multiflorum* cultivar Ariki, a perennial temperate grass, produced a yield of 14,2 tons per ha of green dry matter at the *University* of Pretoria experimental farm during the first season under irrigation (1 September to 31 May).

BLUE BUFFALO GRASS

During the growing season just past, 91 blue buffalo grass *Cenchrus ciliaris* selections were very successfully established in a nursery at Glen for preliminary evaluation.

KIKUYU

Twenty seed-producing ecotypes of *Pennisetum clandestinum* are being tested at Cedara for both seed and dry matter production using the non-seeding variety as a control. From results obtained in the 1972/73 season eight of the seeding ecotypes outyielded the non-seeding variety with respect to dry matter production and four of these seeding ecotypes gave high seed yields.

PASPALUM

Further evaluation of the high yielding cultivar Cedara *Paspalum dilatatum* revealed that its percentage seed germination is almost four times greater than that of commercially available common Paspalum. The new cultivar is also considerably less prone to ergot infection.

ITALIAN RYEGRASS

The very promising performance in the Mist Belt of Cedara Italian ryegrass has confirmed the value of developing forage grass cultivars adapted to local environmental conditions. This cultivar outyielded not only the commercially available "local" strains, but also widely utilised imported cultivars.

Cedara Italian ryegrass is more resistant to South African races of leaf rust *Puccinia coronata* than the commercially available cultivars and its nutritive value is comparable with that of any of the imported Italian ryegrass cultivars. Grazing trials have confirmed that it is relished by livestock.

Apart from satisfying a long-felt need in the Mist Belt for a highly productive and adapted winter forage grass, Cedara Italian ryegrass will overcome the necessity of annually importing a considerable quantity of seed. It will also provide a superior alternative to the currently widely utilised but rather mediocre local strains.

The evaluation of imported and locally-bred Italian rye-grass cultivars is an important aspect of the grass breeding programme at Cedara

NILE GRASS

Approximately 25 years ago Nile grass *Acroceras macrum* enjoyed considerable popularity in the Republic as a highly palatable and nutritious pasture grass. Its use has since waned considerably, because of its reputed inability to set seed.

It has now been established that this phenomenon is due to self-sterility of individual plants. When selected plants of different origin are crossed, however, seed is set prolifically.

In addition to having a seed dormancy characteristic, Nile grass is also hard-seeded. When the seed coat is removed the percentage of germinating seeds is increased nine-fold.

The future agricultural utilisation of Nile grass seed seems to resolve itself thus to the development of a satisfactory method of mechanical or chemical seed coat removal or modification.

A yield trial comprosing four locally collected ecotypes and 21 superior hybrids has been established at Cedara.

Two ecotypes of Nile grass under test at Cedara show promise of being highly disease-resistant and high-yielding.

MAIZE FOR SILAGE

Excellent yields of high quality maize silage material have been obtained at research stations in Natal during the past season. At Tabamhlope on a 4 ha area the hybrid SA 4 at 69 000 plants per ha yielded over 70 tons per ha (equivalent to over 20 tons of dry matter) with an ear content on a dry basis of 44 per cent and a dry matter content of 29 per cent. On an 8 ha area at Cedara the hybrid SR 52 at 44 000 plants per ha yielded over 48 tons of silage per ha. In both cases the production and ensiling costs were estimated at R2,90 per ton. Similar results were obtained at the Kokstad Research Station.

Maize remains the best silage crop in irrigation areas in the Karoo Region. The interest in the making of silage is a sequel to the expansion of the dairy industry. A silage test conducted on the Cradock experimental plot in the Fish River valley showed that those maize cultivars which produced good grain crops were also the most suitable for making silage.

WOOL GRASS

A number of types of wool grass *Anthephora pubescens* are being evaluated and many of them seem promising with regard to production, drought resistance and frost resistance, and may be suitable for establishment in parts of the Northern Cape that are being cleared of bush.

It was found that the seed production of *Anthephora pubescens* can be increased considerably (up to three times) by cutting the grass short immediately before the regrowth stage, rather than later in the season during the piping stage.

CACTUS

A number of breeding strains showed very promising results at Grootfontein in comparison with the standard cultivars Chico, Robusta and Monterey. The material is being multiplied at present for further testing in more places.

In the course of the research programme with spineless cactus it was also found that good fodder production is obtained in areas with a rainfall of under 300 mm by means of two irrigations of 76 mm, one in October and one in December.

Selections of various cactus hybrids and cultivars produced up to 90 fruits per leaf from January to April.

SALTBUSH

The dry winter and spring of the year under review again proved the value of old man saltbush *Atriplex nummularia* as a forage crop in the Karoo areas.

Selection work with old man saltbush continued and the plants selected by sheep over three seasons were multiplied by vegetative means for seed production.

The saltbush collection was further enlarged by the addition of saltbushes from Australia. Some of these plants look very promising.

Observation trials showed that *Atriplex canescens* prefers deep, sandy soils and is particularly suitable for summer grazing. In grazing trials at the Grootfontein College of Agriculture 2 800 sheep grazing days per hectare per summer season were obtained.

Old man saltbush *Atriplex nummularia,* eagerly eaten by Merino sheep in one of the arid districts of the Karoo Region

One of the introductions, *Kochia scoparia*, shows promise in the introduction programme of drought-resistant fodder crops at the Grootfontein College of Agriculture

Atriplex brewerii and *Atriplex lentiformis* provide grazing virtually throughout the year and are very well adapted in the colder parts of the Karoo Region. The plants provided 2 600 sheep grazing days per hectare. Under the same conditions old man saltbush *Atriplex nummularia* gave an average of 2 800 sheep grazing days per hectare per season.

Four saltbush species, each of which was planted on a fifth of a hectare of old land at the Oudtshoorn Experimental Farm in May 1972, are progressing satisfactorily. The four species are *Atriplex nummularia, A. brewerii, A. canescens* and *A. lentiformis.* The young plants were planted in the land straight from the seed beds, and *A. nummularia* established itself particularly well. The second best was *A. canescens; A. brewerii* established itself poorly and had to be largely replanted.

RICE

As in the case of buchwheat and millet, the Transvaal Region undertakes research on rice in co-operation with the Natal Region. All available information on rice production is being collected and a comprehensive publication to serve as a guide for rice producers will be compiled. The most urgent fields for research will also be indicated in the guide.

The production of rice dropped from about 3 000 tons in 1971/72 to a mere 40 tons in 1972/73.

CHICORY

The past year was the second consecutive unfavourable year for chicory, as the spring and summer drought severely reduced the yield. It is estimated that the total yield of dried chicory root for the year ending September 1973 will amount to slightly more than 3 million kg which is considerably less than the 12 million kg usually required annually by consumers.

Seed of chicory cultivars was imported from various European countries in order to ascertain whether any of these cultivars were better adapted to local conditions than the three cultivars currently grown. These three cultivars performed well in comparison with four other cultivars grown in Europe. Interesting differences in growth, root yield, quality and disease resistance were observed.

The possibility of producing chicory seed in the Fish River Valley was investigated. Trials showed that there is sufficient cold activation in the Central and Upper Fish River Valley to produce good-quality chicory seed. The seed yields are also high enough to make it an economic industry in the area and there is a possibility of the Republic becoming self-sufficient with regard to chicory seed.

It was established that *Fusarium oxysporum* can cause stubby root in chicory. Glasshouse trials revealed that the treatment of soil with fungicides results in a reduction of the incidence of stubby root, but that the disease is not eliminated in this way. To date, seed treatments have not been efficacious.

MILLET

Two projects that were offshoots of the millet development programme were launched. In co-operation with the Department of Bantu Administration and Development and the C.S.I.R., the Transvaal Region is undertaking the collection and testing of millet types with a view to increased grain production and nutritive value.

The Division of Plant and Seed Control, in co-operation with the Botanical Research Institute, undertakes the identification and description of the various millet species that occur in the trade in the Republic, with a view to the publication of a descriptive brochure on the various millet types.

BUCKWHEAT

The Eastern Transvaal Highveld is at present the biggest producer of buckwheat and the Transvaal Region undertakes research on this crop.

Arrangements were made for the importation and testing of new promising cultivars that will be more popular on the overseas markets.

POTATOES

Foundation seed preservation scheme

Leaf samples from actively growing potato plants in the Sabie foundation seed scheme were indexed on indicator plants in the glasshouse for the presence of sap-transmissible virus diseases. Five different indicator plants, by means of which all the important sap-transmissible virus diseases can be traced, were used.

All told, 146 leaf samples were evaluated. All the samples were virus-free, except the one taken from the cultivar Koos Smit, which was infected with the potato virus S in the initial phase and then removed.

After thorough preparation of the soil the following cultivars were planted at Sabie at the beginning of September 1972: Up-to-Date (2 hectares), King George (2 hectares), Pentland Dell (0,3 hectares) and Cedara (2 hectares).

It was decided to plant only small quantities of Pentland Dell and Cedara because of early indications that there was no demand in the industry for these cultivars.

The crop was lifted during February and March 1973 and 2 593 pockets (of 30 kg each) of the four cultivars mentioned above were delivered to the Potato Board. This is considered a very good yield.

Enough planting material was retained for 5 ha of Up-to-Date and small foundation plantings of King George, Pentland Dell and Cedara.

In the initial phase, at considerable distance from the production phase, indexed tubers of the following cultivars were planted: B.P.1 (19 tubers), Van der Plank (12 tubers), Koos Smit (3 tubers) and Sabie (3 tubers).

The multiplication of locally bred cultivars – The B.P.1 tubers exceeded all expectations and produced a yield sufficient for another multiplication of about a tenth of a hectare. By cutting the big tubers, 2 000 tubers of this cultivar should be available for the next planting.

The Van der Plank tubers also yielded well. Further multiplication should progress rapidly from now on.

The promising new cultivar Koos Smit is unfortunately infected with a virus and clean material will have to be found first. Yield and adaptation at Sabie were very good.

Potato virus X under the electron microscope – 515 nanometer long and 12 nanometer in diameter (A nanometer equals $\frac{1}{1\,000\,000\,000}$ m)

The new cultivar Sabie produced a great deal of leafage and yielded fairly well. However, a few uneven tubers occur.

Imports

In 1972/73, 2 726 732 kg of potatoes were imported, i.e. 751 262 kg more than during the previous season.

The increase in imports was caused largely by the unexpectedly high prices obtained for table potatoes during the last part of 1972. The rise in prices led to an increase in commercial plantings, which resulted in the demand for seed potatoes exceeding the available supply. In order to meet this demand imported seed potatoes therefore had to be used.

The higher prices also meant that a larger portion of the plantings was marketed as table potatoes and fewer seed potatoes were therefore available in the industry.

The only countries that can meet the import requirements for seed potatoes are Scotland, Ireland, New Zealand and Rhodesia, and at present these countries are the sole suppliers of seed potatoes to the Republic.

The following are some of the chief cultivars and largest quantities imported during the past season:

Up-to–Date – 2 415 529 kg (an increase of 608 934 kg); Pentland Dell – 158 180 kg (an increase of 83 748 kg); Ilam Hardy – 139 131 kg: and King George – 12 689 kg.

AA screenings

Field screening

During the year under review 3 648 ha was accepted for certification, as against the 4 553 ha offered during the previous season – a decrease of 905 ha.

This decrease may be ascribed to the fact that, owing to the good prices for table potatoes, fewer seed potatoes were kept in cold storage for planting, and insufficient rain for early plantings meant that growers in the Western Free State and Vryburg areas were obliged to plant less.

In this region 2 223 ha were planted with locally stored seed potatoes during the past season, i.e. 1 218 ha more than were planted with imported seed potatoes.

Where seed potatoes were rejected the chief reasons were virus infection (in adjoining plantings as well) and mixing of cultivars. 233 ha out of 3 647 ha was rejected. Trial plantings of the cultivars R100 and Lowveld Giant took place for the first time.

Tuber inspections

368 153 pockets (of 30 kg each) were offered for certification, as against the 547 198 of the previous year. The drop of 179 045 pockets was due largely to the better demand for table potatoes and the higher prices the growers received.

32 679 Pockets were rejected in the region concerned, chiefly because of nematode infestation, moth damage, *Rhizoctonia* and brown scab infection.

A screening

Field screening

This year 3 971 ha was accepted for certification as against 4 657 ha the previous year. The drop of 714 ha was caused largely by the early withdrawal from certification by growers, especially in the Transvaal and Natal, who were finding it difficult to control aphids effectively.

The planting particulars for the various regions are as follows: 2 173 ha was planted in the Eastern Free State and the Transvaal, 1 023 ha in the Western Cape, 768 ha in Natal and 7 ha in the Karoo.

282 ha was rejected, chiefly on account of leaf roll, mosaic, mixing and weeds.

The popularity of the South African bred cultivar B.P.1 increased still further at the expense of Up-to-Date. Almost 2 000 ha of B.P.1 was planted, as against 915 ha of Up-to-Date, which is still the second most popular type.

Tuber inspections

In all, 660 073 pockets of 30 kg each were presented for certification, an increase of 5 025 pockets over the previous year. The various A certificate regions offered the following quantities for certification:

The Transvaal and Eastern Free State – 347 168 pockets; the Western Cape – 211 403 pockets; Natal – 100 784 pockets, and the Karoo – 718 pockets.

58 795 pockets were rejected, chiefly on account of namatode infestation, moth damage, *Rhizoctonia*, brown scab and late blight.

Breeding and selection

The two South African bred cultivars B.P.1 and Van der Plank remain the most sought-after of the locally bred cultivars.

Offerings for certification of these two cultivars were as follows:

B.P.1 – 2 253 ha
Van de Plank 1971/72 – 693 ha

It is foreseen that B.P.1 and Van der Plank will be planted on an even bigger scale in the A certificate areas in future. B.P.1 is being planted on an increasing scale in the AA certificate areas.

The following are the chief South African bred cultivars presented for certification during the past season (figures for the previous season given in brackets):

B.P.1	–	2 253 ha (2 495 ha)
Van der Plank	–	792 ha (693 ha)
890/20	–	95 ha (59 ha)
Cedara	–	61 ha (124 ha)

Pests

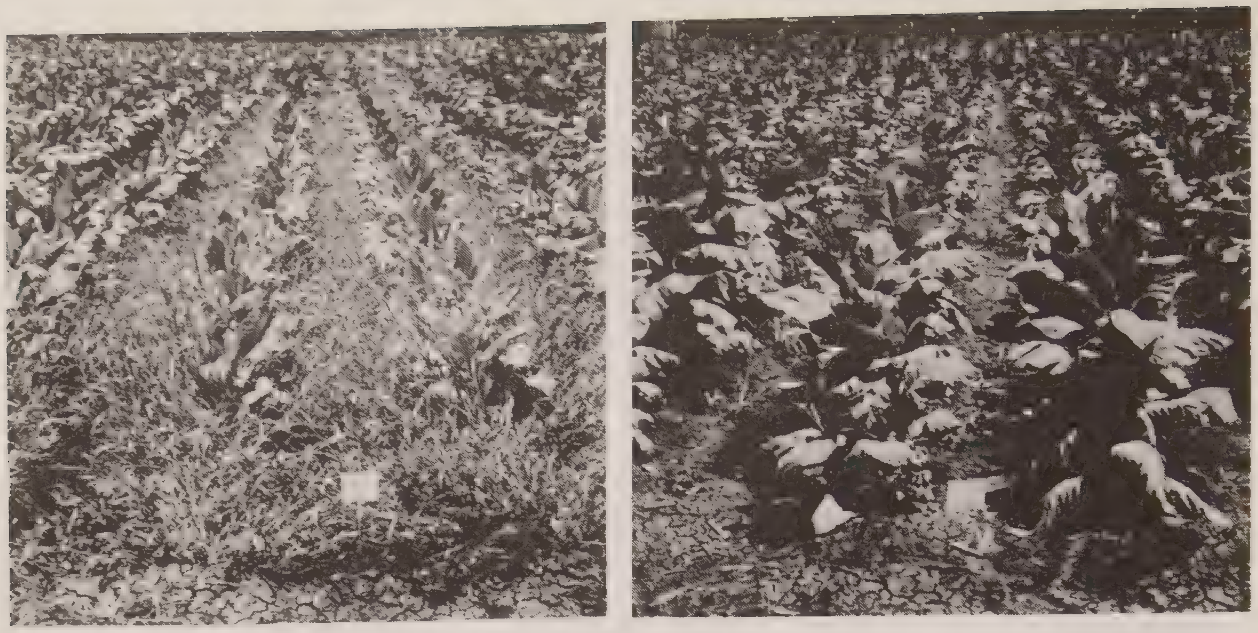
Field studies on the biology and control of the insect pests of seed potatoes in the Cold Bokkeveld area during the past two seasons have led to a better understanding of the problem as a whole and a cheaper and more effective programme for controlling the vectors of the leaf roll virus. In a field trial in the area, for instance, the incidence of infected plants was reduced by means of soil systemic preparations and aerial spraying from 82 per cent of the control plot to within the acceptable limits.

TOBACCO

Production trends

The total production of Virginia tobacco dropped for the fourth successive year, despite an increase in the production of Burley and light air-cured tobacco. The drop in production may again be ascribed to climatic conditions, but smaller plantings also played a part.

Estimates for the 1972/73 season show a further drop in production. The season was characterised by



The effect of a chemical weedicide (right) compared with a planting where no weedicide was applied

exceptionally heavy hail damage over a large part of the production area. This, together with losses that resulted from an exceptionally high incidence of disease, was largely responsible for the smaller expected crop.

Leaf tobacco exports showed a further drop, declining from 10 783 million kg in 1971 to 9 391 million kg in 1972. Shortages were responsible for this drop.

The total domestic consumption increased by 4,02 per cent in 1972 as against 0,8 per cent in 1971. The increase is due chiefly to an increase of 8,2 per cent in the consumption of flue-cured pipe tobacco and 2,97 per cent in the consumption of dark air-cured pipe tobacco.

During the past year 1,3 million kg was imported under cover of 9 import permits. This is an increase of 1,2 million kg cover imports during the previous year.

Breeding and selection

Flue-cured tobacco

Two strains of the black shank fungus, strain X and strain 1, were identified in tobacco-growing soils during the past season. The flue-cured cultivars that were grown for resistance to strain X are still resistant to that strain, but are attacked by strain 1, which was responsible for considerable damage in certain tobacco areas.

Breeding for resistance to strain 1 is being given high priority and a certain amount of success has been achieved.

Burley tobacco

Promising results were obtained with a few Burley cultivars and seed of several new diseases-resistant strains

Production of leaf tobacco, in million kg

Year	Flue-cured	Light air-cured	Burley	Dark air-cured	Turkish	Total
1968/69	20,33	4,50	1,38	9,32	0,87	36,40
1969/70	20,16	3,87	1,67	9,91	0,74	36,35
1970/71	19,65	2,91	0,72	9,19	0,59	33,06
1971/72	17,97	2,85	1,11	8,60	0,77	31,30
1972/73 (estimate)	16,60	3,09	1,26	8,38	0,76	30,09

is being supplied to producers for planting on a larger scale before complete release is considered.

Air-cured tobacco

Seed of a few improved light air-cured tobacco strains was made available. Selection trials with disease-resistant breeding strains showed promising differences in production.

Breeding evaluation in which Maryland cultivars were used showed that it would pay to include these cultivars in the breeding programme, particularly with a view to resistance against disease.

Turkish tobacco

Seed of the cultivar Elcatra was made available to producers. This mosaic-resistant cultivar showed promising results both in cultivar trials and in large-scale cultivation. Electra seed was again made available to producers.

Planting methods

Flue-cured tobacco

Production was lower and quality poorer when flue-cured tobacco was planted in rows 120 cm apart than when the rows were 100 cm apart. No significant differences were found between espacements of 50 and 62,5 cm in the row.

A leaf count of 400 000 gave the highest production per hectare.

These data are of particular importance to producers who are still deviating a great deal from these topping and espacement standards.

Burley tobacco

Higher production was obtained when the topping and espacement of plants were combined in such a way that 500 000 leaves per hectare were produced. Although various cultivars differed in yield capacity, there was no difference in their response to the topping and espacement treatments.

Stubble cultivation

Tobacco was successfully grown on uncultivated wheat stubble where only planting furrows or planting ridges were prepared after the harvesting of the wheat.

This procedure promises to make it possible to cultivate wheat and tobacco on the same soil within a single year.

Antitranspirants

The treatment of tobacco transplants with antitranspirants showed that the rapid wilting of the transplants after pricking out can be prevented and that newly set transplants do not so easily become compacted by the rain and die.

Fertilising and rotational cropping

Nutrient trials in a vermiculite medium showed that, if nitrogen is present in sufficient quantities, plants

The new moisture conditioning facilities at the Tobacco Research Institute where tobacco and cigarette samples are conditioned prior to being subjected to physical and chemical analysis receiving only ammonia nitrogen did better than plants receiving any ammonia nitrogen: nitrate nitrogen ratio.

A field trial with nitrogen showed that the best results are obtained where all the nitrogen is applied in the form of top dressing after 5 weeks. On the other hand, the results of a pot trial showed that if, during the first 4 weeks, only 50 per cent of the plant's total nitrogen requirements is supplied, the yield is lower than when 100 per cent of the plant's requirements are supplied.

It therefore appears that the soil used for the field trial was able to provide sufficient nitrogen to supply the plant's requirements during the first 5 weeks.

Growth curve studies in field trials showed that the increase in leaf mass and in macronutrient intake was at its quickest between the 40th and 90th day after pricking out.

Cultural methods

Sucker control

Sucker control is necessary if the yield and quality are to be good. Off-shoot-T, a chemical preparation for sucker control, yielded highly satisfactory results. Both this preparation and Sprout-off are registered for use on tobacco.

Induced maturation

Further trials with the preparation Ethryl were undertaken. This preparation has a considerable effect on the rate of maturation of the leaf, but its effectiveness depends on its being combined with specific topping and espacement treatment for flue-cured tobacco.

Irrigation

During the past three seasons no differences between flood irrigation and sprinkler irrigation could be registered as far as the growth and yield of tobacco are concerned.

In this trial no differences were apparent between plantings established on ridges and those grown in furrows either. However, studies showed that 80 per cent of the mass of tobacco roots is found in the top 15 cm of the soil.

Diseases and pests

Black shank

In view of the resistance of flue-cured cultivars to strain X of the black shank fungus, the epidemic infection that occurred on these cultivars in certain isolated tobacco-growing areas is ascribed mainly to infection by strain 1 of the fungus.

The intensive programme of breeding for resistance to strain 1 necessitated the development of artificial infection techniques. New techniques for determining the susceptibility of cultivars and breeding strains to this fungus are progressing well.

Seed-bed diseases

The theory that captab is phytotoxic to young tobacco plants in the seed-beds was proved incorrect, even if the standard application is trebled. Because it offers a wide spectrum of control over seed-bed diseases, captab has considerable advantages over the existing seed-bed dusting treatment. This preparation can also be effectively mixed with insecticides such as carbaryl and lannate. Experimental work is being continued with a view to registering captab for use in seed-beds.

American bollworm

A new preparation, carbaryl, was registered for use against bollworm in tobacco. This preparation is safe, economic and has good dusting properties. It is also effective against tobacco slugs.

Nematodes

Ten different preparations for the control of nematodes in tobacco seed-beds were tested. Two of these appeared very promising and will be considered for registration after further trials.

Weed control

Three chemical preparations of the type applied for weed control before planting time were used where tobacco was grown in furrows or on ridges, with or without interrow cultivation. All three of the preparations controlled annual grasses particularly well.

The best general weed control, and for that matter the best growth and yield as well, was observed where weed killers were used in conjunction with interrow cultivation.

Harvesting methods and curing

Hail-damaged tobacco

Where mosaic-resistant cultivars were grown and no significant nematode infestation occurred after hail damage, the cut tobacco recovered remarkably well and yielded a considerable crop.

It has been found that it pays to leave damaged leaves on the remainder of the stalk, which is left on the land after the upper stalk has been cut off. No differences in production when tobacco was cut off at the second, fourth or sixth leaves from the bottom, were noticed.

Whole-plant curing of Turkish tobacco

The results obtained with various combinations of leaf harvesting and whole-plant harvesting did not correspond to those obtained in previous years. During the past season the best results were obtained with leaf harvesting. The yield and the income per hectare dropped where even some of the leaves were left on the plant and cured.

Harvesting methods for flue-cured tobacco

The best yield and quality were obtained when 4 or 8 leaves per picking were harvested, as against 2 or 16 leaves per picking. With 2 leaves per picking the top half of the foliage gradually becomes lusher and greener as the crop is harvested, and a poorer quality top-leaf is obtained.

Bulk curing

The intensive research programme undertaken during the past year to compare the properties of bulk-cured and conventionally cured tobacco reveals no differences between the measurable properties of tobacco cured by these two methods.

Throughout, there is a noticeable difference in the appearance of the two final products, however. This is particularly true of the bottoms. Moreover, in practice the bulk-cured tobacco had a markedly flat appearance, which is indicative of a lack of elasticity.

Research is being undertaken to establish whether these differences can be rectified by modifying the loading techniques, curing schedules and post-curing treatment.

Soil and plant analyses

About 6 200 soil, water and plant samples were analysed during the season. This represents 26 000 analyses. These analyses were particularly important in the case of plant samples from trials under registered projects, where the interpretation of results and evaluation of quality properties would be impossible without the results of the chemical analyses.

5. Horticulture

DECIDUOUS FRUIT

THE WINTER RAINFALL AREA

Owing to the drought and the undersized fruit that resulted, the quantity of fruit that could be exported was considerably less than last season. However, because it was a bad year for fruit in most countries, little fruit was available on overseas markets, so that the demand and prices for South African fruit were very good.

Golden Delicious apples sold without any difficulty, despite complaints from buyers that the apples were too yellow. This complaint arose because fresh South African Golden Delicious apples, which are slightly yellow when harvested at the optimum stage of ripeness, were confused with European Golden Delicious apples, which had been stored for months and had therefore turned yellow.

As the production of apples increases the local market and local processing become more important. This year the marketing pattern was as follows: Export – 50 per cent; local market for fresh fruit – 30 per cent; and processing – 20 per cent.

The bacterial disease *Xanthomonas pruni* which has been a menace to plum orchards for years, has now spread to apricots as well. Quite a number of cases were found among the more important cultivars, viz Royal, Bulida and Peeka, in the Breede river area and near Oudtshoorn.

Disease-free grafting material – 617 stone fruit trees which are considered potential propagation units are now under observation. So far 1 722 pome trees (apples and pears) have been screened. A number of promising sources have been traced.

Several rootstocks were screened; 5 919 rootstocks were marked and will be kept under observation.

The scheme is being tackled on the same basis as the vine screening scheme. In this case the Division of Plant Pest Control is responsible for the phytosanitary aspects, with the Fruit and Fruit Technology Research Institute looking after the pomological side.

At the plant quarantine station of the Plant Protection Research Institute the heat treatment of pome and drupe clone selections infected with one or more viruses progressed well.

Several subclones of 14 cultivars, including apples, pears, peaches, plums and apricots, are already undergoing final indexing.

Apples

Bitter pit – Big apples are generally more subject to bitter pit than smaller apples from the same orchard. The effect of the severity of pruning, which generally also affects the size, was therefore investigated. It was established that severe pruning of a tree generally increases the bitter pit potential, whereas lighter pruning reduces it. If a tree produces badly during a bad year, so that light pruning still produces big fruit, the bitter pit potential is also high.

Diseases – In a continuation of the pot trials aimed at diagnosing re-establishment disease, four soils whose field trial results were already known were used in the pots to ascertain whether the effect is really comparable to the effect obtained in the field. Chloropicrine, EDB and two fungicides, Benlate and Dexon, were tested.

Only chloropicrine induced better growth and the effect was greater in the pots than in the field, although of the same order. The increased effect in the pots should be ascribed to more effective fumigation of the small volumes of soil than was possible in the field.

The testing of the ultra low volume (ULV) spraying technique was continued in trials aimed at controlling apple mildew and apple scab or fusicladium. It was found that about 20 litres is the optimum volume per hectare, but that the quantity of active fungicide can be reduced.

Similar results were obtained in the case of scab.

Important results were obtained in the investigation on fusicladium which has to be undertaken before a monitoring service can be established. It was found that the minimum wetting period that will cause infection is far shorter than the period arrived at overseas by Mills and La Plante. These data, together with the determinations of spore releases with the aid of spore traps, will be used for testing preliminary warnings.

Insect pests – Further tests with the systemic preparation vamidothion showed that woolly apple aphid can now be controlled so effectively that further research is unnecessary for the present. Midseason applications control not only the colonies above ground, but also have an inhibitory effect on root infestations.

It was found that versatile preparations like methidathion and omethoate, which are used for codling moth, mealybug and aphids, also have an inhibitory effect on the epigeal colonies of woolly apple aphid if they are properly applied and the infestation potential is not too high.

Research is being done at present on the effect of all sorts of sprays on the natural enemies of the red spider *Tetranychus cinnabarinus* and the European red mite *Panonychus úlmi.* It has been found that some of these fungicides have an inhibitory effect on *P. ulmi,* whereas preparations used for codling moth, such as carbaryl and azinphosmethyl, destroy some of the predatory mites which live on the phytophagous mites.

Pears

Packham's Triumph is one of the most popular dessert pear cultivars, but in many orchards production is limited by poor fruitset. In an investigation into this problem it was found that fruitset can be increased considerably in some cases by a spraying of 8 ppm of 2, 4, 5-trichlorophenoxypropyonic acid during the period mid-March to mid-April. But there were still cases where no satisfactory results were obtained, chiefly in young trees and trees displaying lush growth.

In certain cases it was found that inadequate cross-pollination caused poor set, but the results were not consistent here either, particularly in young trees. Packham's Triumph is self-incompatible and therefore has to be cross-pollinated. Better fruit-set is obtained with a cross-pollinator such as Forelle, which flowers slightly earlier than Packham's Triumph, than with other cultivars which have thus far been planted commercially as cross-pollinators, but which flower slightly later than Packham's Triumph.

Pear trees planted on seedling rootstocks are inclined to grow too big in time, so that pruning and harvesting become difficult operations and the lower parts of the trees get insufficient light for production. At the Bien Donné Research Station attempts were made to render an old orchard of oversized trees productive once more by sawing off branches and pruning severely. This came to nothing, however, since the trees regained their former size within three seasons.

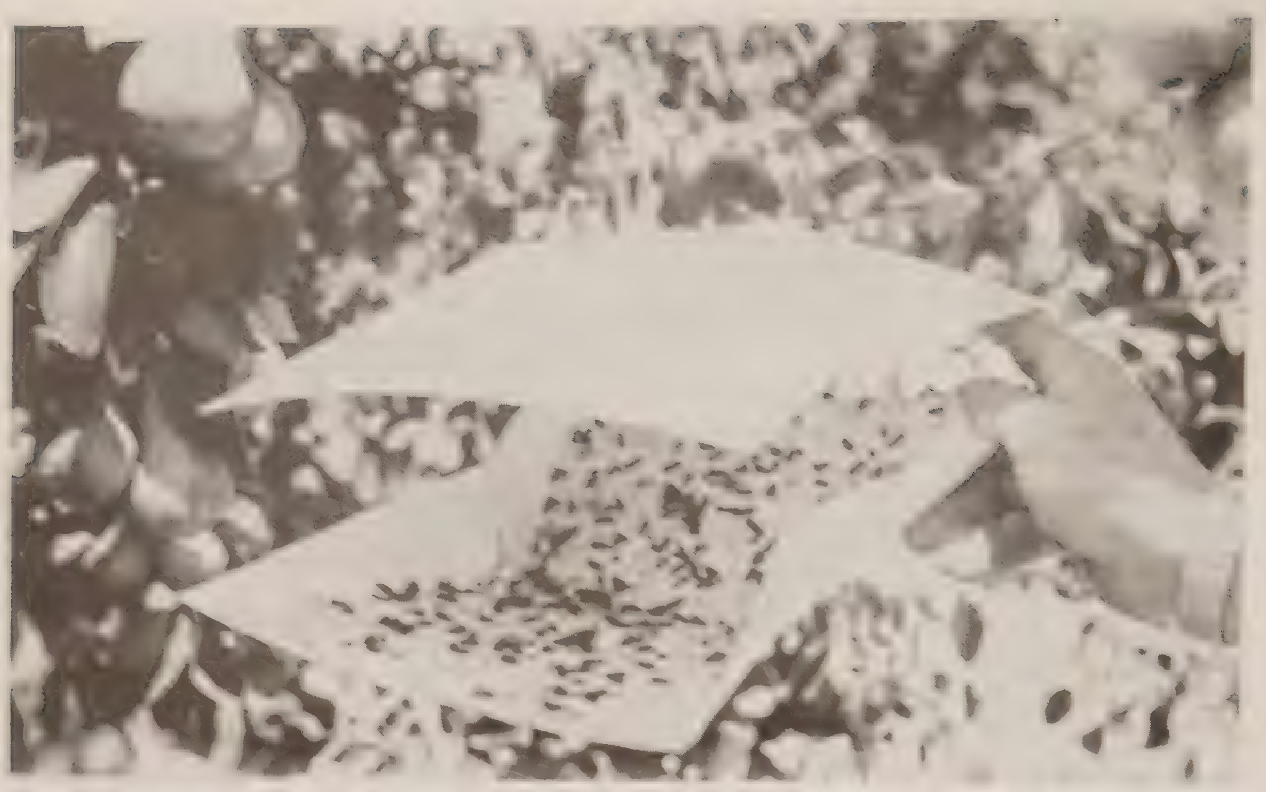
The only remedy is to replace these old orchards.

Peaches

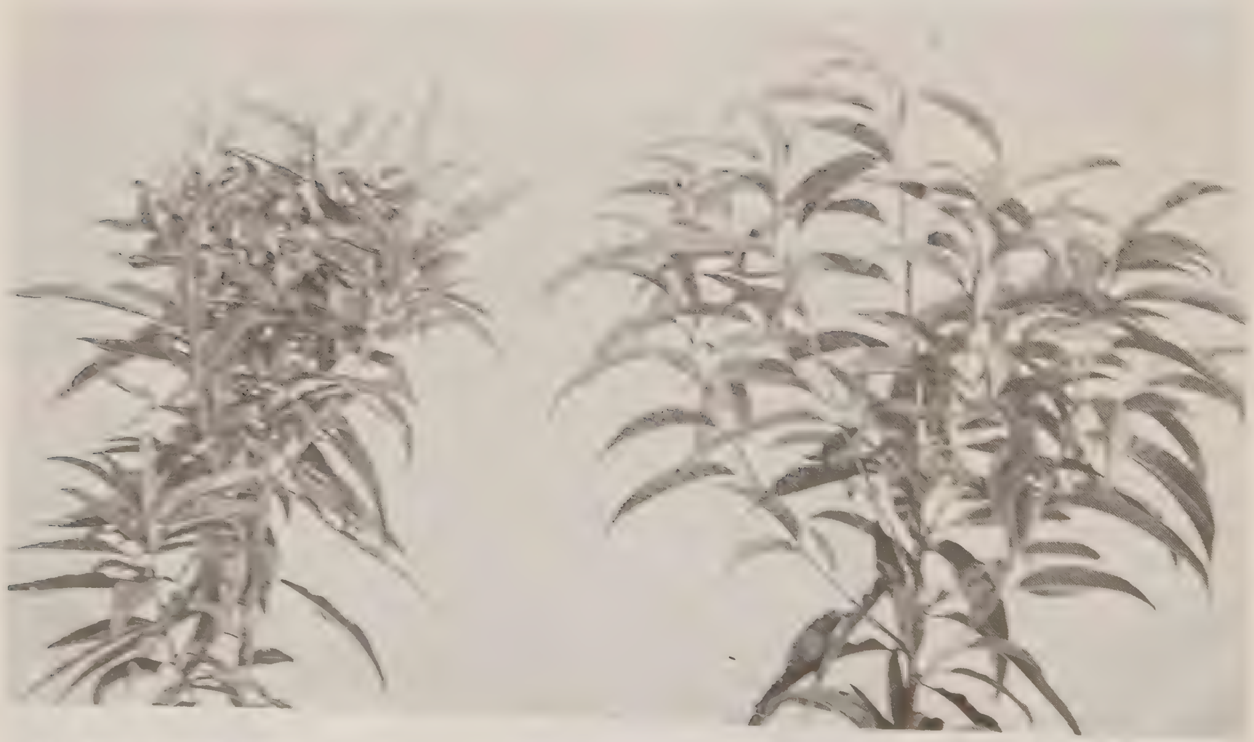
Further investigations into rosette of peach trees, which does a great deal of damage to the cultivars Goosen and Keimoes in the Elgin area and spreads rapidly from tree to tree in an affected orchard, confirmed that there were new infections in Kakamas peaches in the Somerset West area. In one orchard of about 500 trees production had already become uneconomic at 12 years.

Trials confirm that *Prunus* necrotic ring spot virus and plum prune dwarf have to occur together before the rosette syndrome develops.

Fruit of the new plum cultivar Harry Pickstone on the tree. The tree was grafted on virus-free Marianna rootstock



The pheromone sex trap in use in a peach orchard



The characteristic symptoms of leaf and shoot rosette (left) in Keimoes peaches. On the right is a healthy branch and shoots

Since both these viruses are spread by pollen, the necessity for disease-free propagation material is obvious.

Plums

For the second successive year a new plum cultivar was made available to the industry. This is the cultivar Harry Pickstone, named after one of the pioneers of the fruit industry in South Africa. It is a midseason plum that ripens in the second or third week of January. It is fairly resistant to bacterial spot of plums *Xanthomonas pruni*, bears well and should meet a great need in the plum industry.

THE SUMMER RAINFALL AREA

The chief problem of the deciduous fruit industry in the summer rainfall area is the ignorance of a very large percentage of producers and prospective producers about deciduous fruit production.

It is therefore no wonder that in the Transvaal alone 120 000 peach trees were planted of cultivars so badly adapted that their production is negligible, and that in the Free State, where spring frost is common, cultivars such as Oom Sarel, which flowers very early, constitute about 35 per cent of all peach plantings.

One of the results is that the average yield per hectare of peaches is 4,0 metric tons in the Free State and 6,0 metric tons in the Transvaal – as against 14,7 metric tons in the winter rainfall area.

In an attempt to remedy this critical position, the Horticultural Research Institute has written a series of 25 leaflets on all aspects of cherry, peach, apricot and table grape cultivation in the summer rainfall area. These leaflets will be made freely available to all producers or prospective producers. The aim is to use a mailing list and send all these leaflets to all deciduous fruit producers in the area.

Peaches

Whereas yellow canning cultivars (for dessert purposes) used to be the chief type planted in the summer rainfall area, there is a great demand at present for the locally bred new white- and yellow-fleshed true dessert cultivars.

Interest in the new cultivars is due chiefly to their comparative earliness, which means that it should be possible to get good prices on the local market. Interest in these cultivars was also stimulated by the success with which a trial consignment of one cultivar was exported by air to overseas markets.

The peach breeding programme in the summer rainfall area is progressing very well, as is apparent from the number of cultivars already released and from the results of co-operative cultivar trials in the area in which strains are being tested by producers.

The Horticultural Research Institute released a yellow-fleshed freestone peach, Safari, during the year under review. The new cultivar ripens early in December, when no other yellow-fleshed dessert peaches are available. The fruit is oval, with an average diameter of 7,0 cm and over 90 per cent of the fruits are bigger than 6,0 cm. The fruit is firm, slightly sour and keeps well.

An important point about Safari is that it flowers late in August. Consequently it should also be well-adapted in parts such as the Eastern Free State and the North-Eastern Cape, where late frost is generally a problem. Trial plantings in the Western Cape showed that Safari seems very promising there as well.

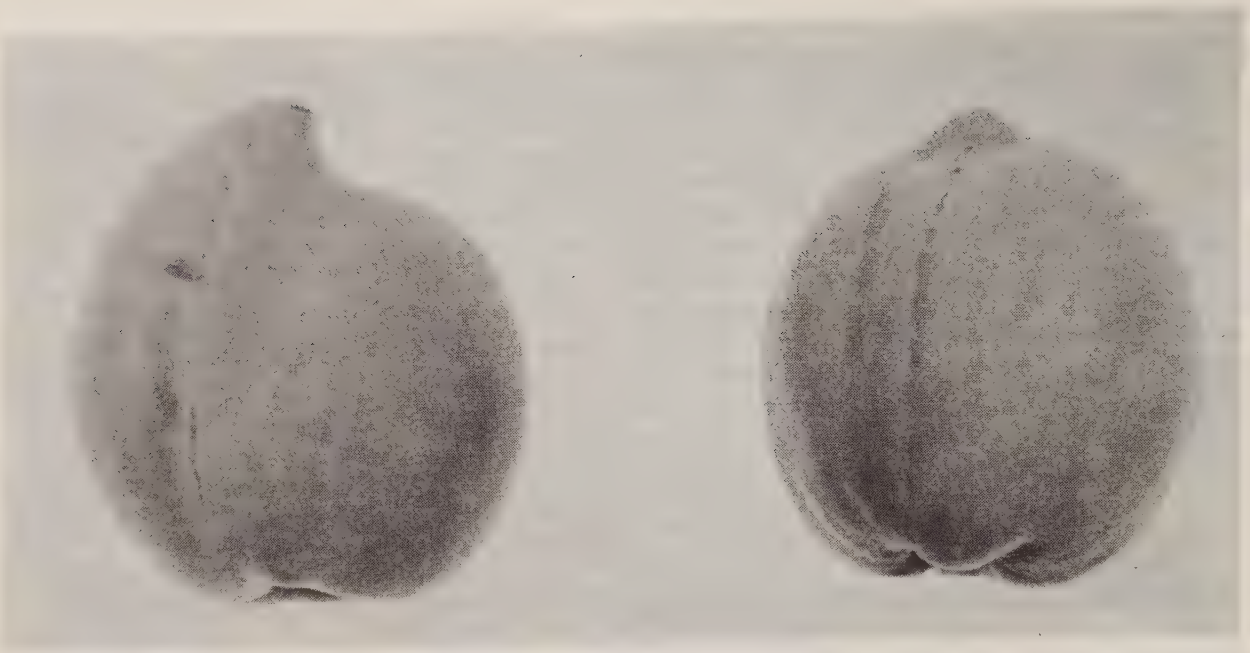
In order to breed a nematode-resistant peach rootstock, 15 Nemaguard F2 clones were artificially infested with *Meloidogyne incognita*. Two clones were completely resistant to the nematode. This material will now be infested artificially with *M. javanica* to determine how resistant it is to the nematode.

All Transvaal clingstone peach clones, which are generally used as rootstocks these days, were very susceptible to *M. incognita*.

Last year the testing of a newly developed weedkiller, glyphosate, for use in peach orchards, was started. This is a contact weedkiller which is absorbed by the green parts of the sprayed plants and translocated through the plants. It gave particularly promising results, and no phytotoxicity was observed with peach trees.

False codling moth – Because this insect is particularly common in late peaches, it is a threat to the yellow clingstone peaches in the area. Studies have shown that peaches only become susceptible to infestation during the maturation period – about four weeks before picking time for the early cultivars and about six to seven weeks before picking time for the late cultivars. The results also show that the moths apparently fly very little and that movement between the various orchards is restricted. Sanitation is therefore an important measure in the control of this insect. This includes the destruction of infested fruit, and especially of alternative host plants.

Control trials with insecticides were very successful. The preparations should be applied by spraying three to four times during the last six weeks before harvesting. The following preparations significantly reduced the infestation: azinphosmethyl, bromophos, diazinon, fenitrothion, methomyl and



The effect of rosette disease on peaches. The affected fruit (left) is not only malformed but also ripens leanly. On the right is a normal Keimoes peach

phosrel. However, residue analysis is yet to show whether the sprayed fruit is safe for human consumption at harvesting.

So far no preparation for the control of false codling moth in peaches has been officially registered.

Apricots

Although the apricot cultivars Alpha, Early Cape and Bulida are fairly well adapted in the summer rainfall area, not one of them is suitable for fresh marketing or for canning purposes. Although the new cultivar Peeka is a big improvement on the above-mentioned cultivars, there is a real need for a number of cultivars that will be suitable for both the fresh market and the canning industry.

Such cultivars should bloom after 5 August and ripen from the beginning of November to the end of December. Breeders are trying to develop cultivars with fruit that will be as big as, or bigger than, that of Bulida, have a good colour, be resistant to cracking and have good canning quality.

A few hundred crossings were either pricked out as seedlings or top-worked on to rootstocks. A number of these crossings should produce their first crop this year.

Cherries

Apart from bacterial canker, which is still one of the chief problems affecting the yields of sweet cherries, the past season was also characterised by serious drought followed by devastating hailstorms in the major portion of the cherry-producing area.

In the research programme at the Ficksburg cherry experimental farm a start was made with the testing of the various propagation techniques for cherry rootstocks. Mahaleb and Stockton Morello were fairly easily propagated by means of hardwood cuttings, and Mazzard F12/1 rooted well with the aid of stool layerage. It was evident that there is a possibility of multiplying Mazzard F12/1 by means of hardwood cuttings as well.

Although the same treatment produced widely differing results, certain combinations of treatments produced very good rooting.

A cherry rootstock trial which includes three rootstocks and eight cultivars, and a cultivar trial which includes 23 cultivars and 12 rootstocks or clones, was started.

TABLE GRAPES

WINTER RAINFALL REGION

In the Hex River Valley, the chief table grape area, conditions were very unfavourable owing to the low rainfall, and the export season was a poor one.

Breeding and selection – Six promising crossings were added to 13 from the previous season for evaluation on the experimental farms of the Fruit and Fruit Technology Research Institute.

The evaluation of locally bred crossings and crossings bred by the Horticultural Research Institute at Roodeplaat as well as imported cultivars is enjoying a great deal of attention.

Three of the imported cultivars seem very promising. The particulars are as follows:

Cultivar	Colour	Time of ripening	Berry size	Fullness of bunches	Incidence of seedless berries	Growth vigour	Remarks
Dan-ben-Hannah	Black	Early, 9–16 days before Alphonse Lavallée	Medium	Moderately firm	None	Good	
Italia	White	Early, 10 days before Waltham Cross	Big	Moderately firm	None	Fair	Light Muscat flavour. Slight tendency to show chafe marks on skin
Cardinal	Red	Together with Dan-ben-Hannah	Very big	Moderately loose	Slight	Good	

All three cultivars are very prolific. Dan-ben-Hannah was imported as a Black Mikveh X Alphonse Lavallée crossing and was only recently given a cultivar name by its breeder.

The programme for selecting the best genotypes of important existing cultivars is progressing well. At Barlinka 50 selected clones were compared under identical conditions for four years and the outstanding clone was identified. This clone, No. 47, produced the best yield of export quality black grapes over the four years.

This clone will be released to the industry in 1973 as the best available Barlinka material.

In the case of Queen of the Vineyard 26 selected clones have been compared under identical conditions for three years. It has been found that the clones differ greatly with regard to yield, quality and prolificacy. In this case, too, material of one clone will be released to the industry in 1973 as the best available material.

Diseases – The fungus that causes dieback owing to root rot in table and wine grapes was further investigated. The Commonwealth Mycological Institute confirmed that the pathogen is *Phytophthora cinnamomi.*

Pathogenicity was tested by inoculating rooted R99 and Jacquez cuttings with the fungus, both in a water culture and in soil in pots. In both cases the R99 cuttings were far more susceptible than Jacquez, and about 80 per cent died.

The cause of a troublesome disease in table grapes, commonly known as *berry-stem ring,* was established. The disease is characterised by a black band that develops around the narrowest part of the berry stalk and causes the berries to wilt. Investigations have revealed that this phenomenon may be ascribed to a magnesium deficiency and can be effectively controlled by a series of four sprayings with magnesium sulphate (10 kg per 500 litres) at fortnightly intervals from the end of December to the first week in February.

Mealybug

The vine mealybug *Planococcus citri* is still one of the table-grape farmer's worst enemies in the Hex River Valley. It was again proved during the past year that the release of predatory beetles (Coccinellid predators) has little effect if sulphur dusting is applied more than once in the season.

A survey of the quality of Waltham Cross grapes was undertaken to establish why the quality of the grapes on arrival at overseas markets varies so much. Samples of ten trays per plot were obtained twice during the season from each of the 20 farms in the Upper Berg River area. The quality of the grapes was judged immediately they were received and again after storage for three weeks at the optimum temperature, viz -0,5°C.

There were great differences in quality between the various samples, even when the grapes were judged immediately prior to storage. About 22,5 per cent of the samples were of good quality, 50 per cent were of fair quality and the rest of poor quality. The investigation is being continued.

Good progress is being made with the elimination of viruses in table grape clone selections by heat treatment. So far, 125 subclones of the chief cultivars, including Barlinka, New Cross, Queen of the Vineyard, Salba and Waltham Cross, have been established.

5 mm tops of Waltham Cross clone 44 which rooted successfully on an agar feeding medium after a heat treatment of over 150 days at 38°C

The successful development of a medium in which growing points of *Vitis vinifera* cultivars can be rooted after heat treatment will greatly increase the possibility of the successful elimination of viruses in heat-sensitive cultivars, since smaller growing points can now be used.

A virus disease similar to grapevine yellow speckle, which was recently described in Australia, was found in a local Waltham Cross vine. The symptoms may very easily be confused with those of vein-banding, which is common in South African vineyards. Vein-banding is sap-transmissible, however.

THE SUMMER RAINFALL REGION

As a result of the release of two new grape cultivars, Jacaranda and Golden City, interest in table-grape planting increased further.

It would appear that table-grape plantings in the summer rainfall area are executed with far more discrimination than peach plantings. On the whole, there is a much greater awareness of labour and water requirements among table-grape growers, who also display a far better knowledge of the industry than the peach producers do.

The objects of the table-grape breeding programme for the summer rainfall area are:

- good quality cultivars (white and black grapes) for the local markets and for export
- a better spread of cultivars over the season from the point of view of ripening
- cultivars that mature even earlier than the present ones
- high quality seedless cultivars
- resistance to disease

Considerable progress has been made with this programme, as the four cultivars already released and the number of promising selections now being tested co-operatively on the farms of producers show. The thousands of crossings made during the past few years are now being evaluated and the prospects of developing more new cultivars in future look promising.

WINE GRAPES

Production trends

One of the most striking features of the growth and development of the wine industry is the increasing interest in and discriminating use of wine by the public. The result has been that the consumption of natural wine has increased steadily during the past few years. Consumers used to be interested virtually exclusively in the average class of white wine, preferably containing a little sugar.

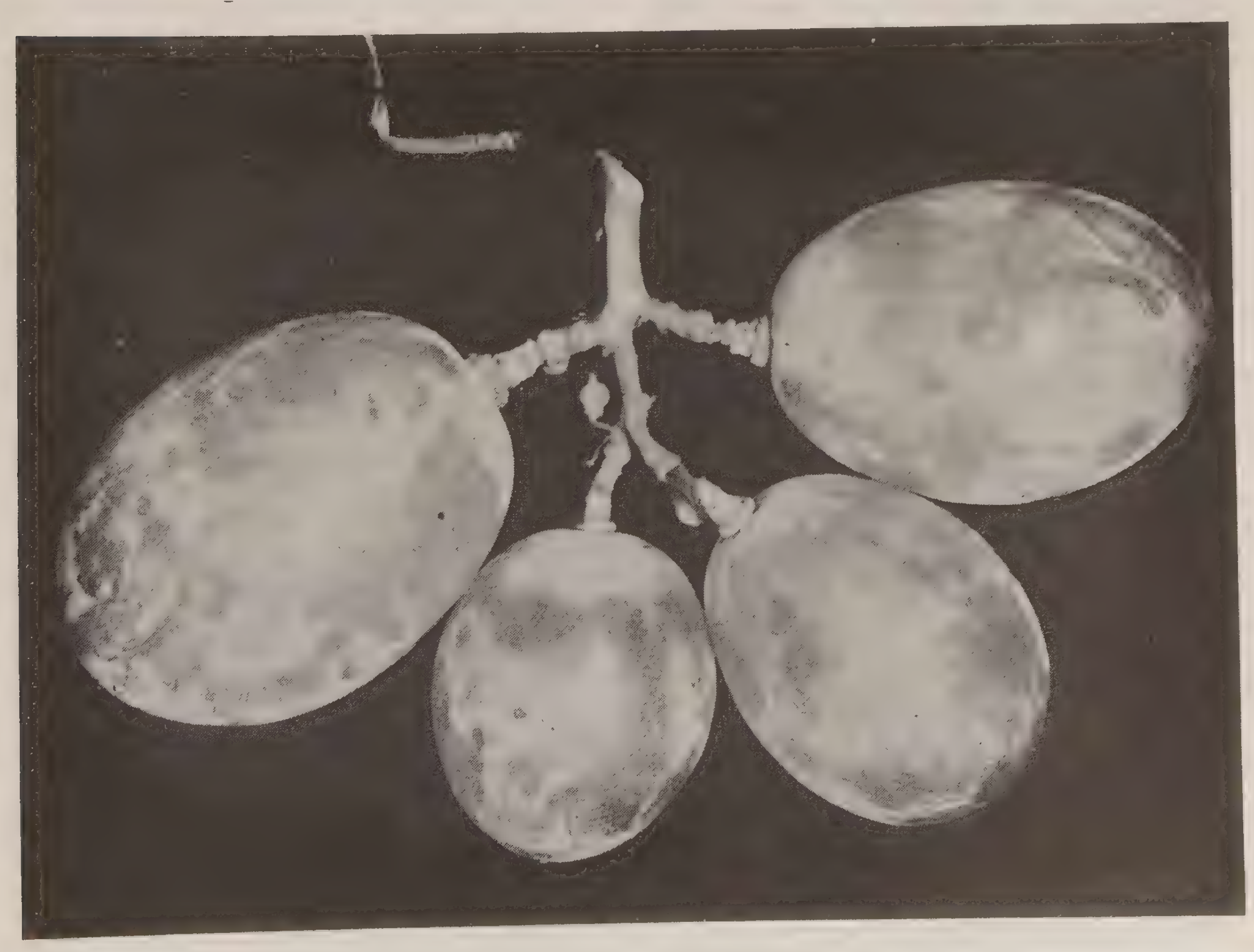
Gradually – and this has been particularly noticeable during the past year – preference for red wine and other wines of higher quality also became evident. Generally speaking, South African consumers have developed increasingly refined and sophisticated tastes for wine.

The fact that consumer preferences have become more pronounced will be an incentive to producers to give more attention to the production of wine that will satisfy consumer tastes; and more careful selection of the areas, soils or cultivars that produce such wines can be expected. Well-timed and carefully directed research could make a far greater contribution now than was the case a few years ago, when the need was not such a real one.

Another result of the increasing interest on the part of consumers and producers in wines from certain farms (estates), areas, cultivars or vintages, was that the Department of Agricultural Technical Services had to provide legislation during the past year to protect these wines. The implementation of this legislation makes it possible to judge research results not only by the quality of wines made in research wineries, but also by the quality of the wines as marketed, and more important, by the preference of the consumers for such products.

Evaluation of imported cultivars

Experimental wines were made from released scion cultivars, namely Sylvaner, Gewürztraminer, Emerald Riesling, 11–54 G.m., 3–48 G.m. and Pinot noir. These varieties were declared free from harmful viruses by the Division of Plant Pest Control. Larger volumes of wine were made from the cultivars Weisser Riesling cl. 55, Bukettraube and Kerner. These vines are now six years old.



Pedicel rot in table grapes. Note the dark deformation at the berry stem

Bukettraube appears to be the most promising of the new wine grape varieties for South African wine-making. It grows very vigorously, bears prolifically, is well adapted both at the coast and in the Karoo, and produces wine of good quality. Although it is inclined to rot, particularly at Robertson, its resistance to rot is far better than that of Steen.

Weisser Riesling, Kerner and Sylvaner dot not bear as well as Bukettraube, and Weisser Riesling is also inclined to rot. The rot percentage was determined on a mass basis for every fifth vine harvested.

Scion cultivars in open quarantine – A total of 28 imported cultivars, which were placed in open quarantine at the Oenological and Viticultural Research Institute by the Division of Plant Pest Control during 1968, were established on 99 R and 110 R rootstocks in the new collection block at Nietvoorbij. About 20 vines per cultivar of the same varieties as were established on Jacquez in 1971 by the air-layering method are doing well.

Evaluation of locally-bred crossings – Experimental wines were again made from grapes from the crossings of the scion varieties K1 and K2. The grapes came from Nietvoorbij and Robertson. Both crossings, but particularly K2, appeared to have very good resistance to rot.

The determination of the oenological qualities of scion cultivars in field trials – This trial includes the testing of well-known wine grape varieties which were imported before 1914, but have not yet been properly tested. Experimental wines were made from the grapes of 30 white and 11 red varieties. The grapes came from the Nietvoorbij, Robertson and Elsenburg Experimental Farms. Oenological qualities such as crop mass, sugar, acid, resistance to rot, etc., wery noted. The wines were evaluated by a panel.

The cultivar which has long been grown in South Africa under the name of Roter Traminer is the same as Gewürztraminer. However, the former does not by any means grow and bear as well as the imported Gewürztraminer. It appears that Müller-Thurgau is not well adapted in South Africa. It bears well, but its growth vigour is poor at both Nietvoorbij and Robertson.

The South African Sémillon is a poor grower and is very prone to leaf roll. The same goes for Chardonnay. Muscat Ottonel seems an interesting variety. Unfortunately its growth vigour at Nietvoorbij did not measure up to its bearing capacity.

The white varieties Colombard, White Hermitage and Hanepoot did very well as regards yield and wine quality at Robertson, and Muscat Ottonel, Sauvignon blanc, Clairette Egreneuse, Colombard and Raisin blanc did well at Nietvoorbij. Among the red varieties the outstanding performers at Nietvoorbij were Pinotage and Cabernet franc.

The collection of wine grape cultivars at Nietvoorbij – The crop and shoot masses of 55 scion cultivars, grafted on six different rootstocks, viz 99 R, 101–14, Jacquez, 143 B, 3306 C and Rupestris du Lot, were recorded for the third time. The comparative results of the three years show that 99 R is outstanding in comparison with the other rootstocks in the collection.

Over the past 3 years 99 R produced the highest crop masses of all the scion varieties in the collection 48 times, followed by Rupestris du Lot (16 times) 143 B (14 times), 3306 C (6 times), and 101–14 94 times). Jacquez did not once produce the highest crop mass.

Data and visual observations indicate that the rootstock Jacquez is deteriorating on the old vineyard soil of the collection, particularly in graft combinations with cultivars that bear heavily and grow poorly such as Grenache, Zinfandel, White Hermitage, Muscat Ottonel and Müller-Thurgau. Heavy phylloxera infections were observed on the roots of Jacquez.

Rootstocks – Tests on the production of 9 rootstock cultivars were carried out in six trials (areas). It was found that of the industry's chief rootstock cultivar 101–14 is the only one that is not being threatened by either phylloxera or *Phytophthora cinnamomi* or by unexpected deterioration. The problem is that this rootstock shows poor affinity with a few important wine grape cultivars such as Colombard, and it does not do well on all soil types.

Notwithstanding the promising performance of various rootstocks, the position is unsatisfactory and new rootstock cultivars will be tested as soon as they become available in the various viticultural areas.

The selection of disease-free graft sources – The first selected rootstock material was issued to the various nursery associations during the winter of 1972 for establishment by individual nurserymen. The entire process was successful and the prospects for the near future are promising.

As regards scion cultivars, only the table grape Waltham Cross has so far been issued for establishment in approved blocks. Establishment took place on approved plots in the Hex River Valley and at Paarl. No additional scion cultivars will be made available to the industry next season.

The K.W.V. has undertaken to graft all scion cultivars first and then issue grafted vines to growers during the winter of 1974.

All told, 80 450 rootstocks of selected vine material were allocated and it is estimated that 62 179 are growing. The rootstocks were planted in 28 approved blocks. In 1972/73 there were 365 registered vine nurseries in the Western Cape, with a total of 29 107 000 vines.

"New Virus" – The finding of the Arabis mosaic virus in a local Steen grapevine infected with stem-pitting indicates tha this nematode-borne virus may play a part in this widespread grape disease.

This is the first time this virus has been reported in South Africa.

Cultivation and fertilising

Soil preparation – In trials at Nietvoorbij and on the Robertson Experimental Farm two trenching depths, viz 75 cm and 125 cm, were compared as the main treatment, combined with applications of salt and sawdust compost as a subsidiary treatment.

At Nietvoorbij it was found that on the Clovelly soil type various treatments had no effect on the crop or shoot masses. However, long-term results are required before any reliable conclusions can be drawn.

At Robertson, on a Shortlands soil type, the various treatments did not produce any significant differences either.

According to tests with a ripper and a shallow lister at Nietvoorbij there is little doubt that deep-trenching soil preparation has decided advantages on the deep, red and yellow soils with a high potential that belong to the Clovelly and Hutton soil forms and are particularly common in the vicinity of Stellenbosch, Paarl and Somerset West.

Deep trenching together with judicious liming can contribute to the more effective utilisation of the high production potential of these soils. As in previous seasons, no significant difference could be shown between the subsoiler and the shallow lister treatment as far as the latest crop masses go.

At Robertson the various methods of soil preparation did not give rise to any differences in crop masses.

In the analysis laboratory of the Liquor Control Section of the Oenological and Viticultural Research Institute a great number of samples are analysed every year

The great difference in growth vigour in establishing a vineyard with a plastic soil cover (left) and without (centre)

At neither of these places were there any significant differences between deep trenching without organic matter and deep trenching using organic matter. Chaff and sawdust compost dressings had no effect on shoot or crop masses.

The establishment of vines – The establishment of vines under dryland conditions was investigated at the Oenological and Viticultural Research Institute's experimental farm in September 1972 with a view to obtaining a more even stand.

In order to reduce the loss of moisture from the soil and the young vines, combinations of the following treatments were applied at planting: a plastic soil cover, the use of a mole-hill, covering the graft and graft union with wax, and leaving a single long shoot which is later cut back. Vines rooted in cardboard containers were also used in the trials, without plastic soil covers.

At this stage no conclusions can be drawn as to the effect of the wax cover, the mole-hilles or leaving a long shoot which is pruned before it comes into bud. After the first growing season, however, there were clear differences in growth vigour between the vines under the plastic cover and those that were clean-cultivated. Right from the beginning of the growing season the former grew more vigorously than the vines that were celan-cultivated.

Soil moisture determinations at a depth of 30 cm during the growing season also showed clear differences between vines under a plastic cover and clean-cultivated vines. The soil moisture was better throughout under the plastic soil cover, except towards the end of the growing season (April). The vines under the plastic soil cover had 37 per cent (November) to 10 per cent (March) more moisture at their disposal than the clean-cultivated vines had.

No noteworthy differences in the average soil temperatures at 25 cm were observed between the two treatments. It is clear, however, that the plastic soil cover has a stabilising effect on the soil temperature.

The favourable response of the vines under the plastic cover may be ascribed chiefly to the higher soil moisture content and presumably also to the more even soil temperatures, which make for better root development.

Only 10 per cent of the vines in cardboard containers died. The others established themselves surprisingly well in the vineyards. This practice has decided possibilities under conditions like those in this trial.

Spacing and training

Spacing and training trials have shown that on soils that are at least moderately fertile and where moisture is not a limiting factor, growth vigour and therefore productivity increases when a bigger trellis and therefore a larger leaf area per ha is provided, with the same row width. The greater aerial development of the vines stimulates greater root development.

Wider working rows (within limits) can be used on soil of a given fertility without a drop in the production per ha, provided the leaf area per row is increased at least to the same extent as the row width, by means of a suitable training system. Depending on the soil fertility, areas of 3,0 to 7,0 square metres (32 to 75 sq. ft) per vine are recommended – the better the soil, the larger the area per vine.

The ratio between width and espacement in the row should not exceed 3 to 1.

To sum up, it may be said that on the better soils the leaf area per row and therefore per ha is more important than the planting width. On the poorer soil, on the other hand, planting widths are more important than leaf area per vine or per row and the best production per ha is obtained with smaller soil areas per vine.

Wines were made during several years from the cultivars Cabernet Sauvignon, Riesling, Steen and Hanepoot used in the above-mentioned trials.

Even where the production was increased considerably with the aid of training trials in comparison with production from the control bush-trained vine treatment, there was no deterioration in the quality of the wine. The yield increases varied from 67 per cent in the case of Cabernet Sauvignon to 259 per cent in the case of Steen grapes.

This favourable result may be ascribed chiefly to the fact that the correct balance was maintained between the crop per vine and the leaf area per vine.

Tillage studies

The crop mass data for the 1973 vintage obtained in the course of the unirrigated tillage trials at Nietvoorbij again underlined the effect of a straw mulch on yield increases.

The straw mulch treatment produced the highest crop yields on the average and was significantly better than all the other treatments, viz the shallow lister, deep lister, clean cultivation, weedkiller and bush slashing treatments.

There were no significant differences between the shallow lister, deep lister, clean cultivation and weed-killer treatments. The bush-slashing treatment, which may not have been applied early enough, and which produced the lowest average crop yields, gave significantly poorer results than all the other treatments.

Diseases and pests

Phytophthora – The research project aimed at determining which pathogens are involved in the dieback syndrome and the sudden death of vineyards, and how generally they occur, has been completed.

So far it has been found that *Phytophthora cinnamomi* is the only fungus in South African vineyards responsible for the sudden death of Richter 99, Richter 110, *Vitis rupestris,* Rupestris du Lot and Rupestris St George.

Steen grapes trained on big trellises show exceptional growth vigour and give a big yield at the Robertson Experimental Farm without a reduction in the quality of the grapes or wine

During the past year the Rupestris St George rootstock has shown that it is particularly sensitive and dies on a large scale even when it has not been grafted, and also on soils where no vines have ever been grown.

There is every indication that wet conditions increase the danger of attack by this fungus, if the organism is present. The harmful effects the fungus have been observed several times in the best vineyard soils. It may even kill vines in the nursery. As far as is known, nine-year-old vines are the oldest to have been killed by this fungus.

The fungus has been found in virtually all soil types except very poor, sandy soil, in various districts from Montagu to Groot Constantia.

Shoot samples from the Lower Orange River were examined for the presence of the mite *Eriophyes vitis* during July 1972 and March 1973. Large numbers of mites were found and it is clear that mite control merits very serious attention.

The treatment of French vines during October 1972 in the Olifants River area with chlorobenzilate and bromopropylate resulted in a statistically significant reduction in the number of mite-damaged bunches. There was also a trend towards bigger crops in the treated plots.

Downy mildew – A study of the incidence of downy mildew caused by *Plasmopara viticola* in the vineyards of the Western Cape was carried out during the five vintages 1968/69 to 1972/73.

Oospores (winter spores) were found in old, infected leaf tissue, but no oospore germination was observed. Presumably the oospores make it possible for the fungus to survive during the winter months.

Downy mildew was observed on certain late cultivars in the very late autumn. This outbreak of the disease may promote the survival of the fungus during winter and lead to the build-up of a high inoculum potential for spring infection.

Growth arrestment disease – An extensive field investigation, involving 280 sultana vineyards from all parts of the Lower Orange River viticultural area, indicates that the following factors are related to both the incidence of growth arrestment disease and poor unit yields.

It was also concluded that the normal moisture and temperature conditions of early spring in all the viticultural areas of the Western Cape are favourable to primary downy mildew infection. The normal summer temperatures obviously have no inhibitory effect on the development of the disease either.

However, moisture, particularly rainfall, is the critical factor which decides whether a high level of disease will be maintained throughout the summer. Under ordinary dry summer conditions the fungus remained viable in lesions on vines for seven weeks, and then formed spores in wet conditions – which explains the relatively high degree of infection during autumn.

The original epidemic in 1968/69 is now ascribed largely to the generally high rainfall and the absence of the south-easter that season.

Other causes were high clay and silt content and low fine sand fraction, high soil strength, high exchangeable calcium, magnesium and sodium, low potasssium and (to a lesser extent) phosphorus, and a *low* electrical resistance (more salts in solution).

Plant analyses largely confirm the deductions made from soil analyses, viz that there is a calcium and magnesium content in the case of diseased vineyards. The trace element content, viz the zinc, copper, manganese and iron, present in diseased vine leaves is higher than that of healthy leaves. The moisture content of bearer shoots and young leaves of diseased sultana vines is lower during the growth arrestment period than that of healthy vines.

Water application during the pre-budding period and the budding-to-flowering period were significantly lower in the case of diseased vineyards.

Vineyards where a system of minimum cultivation is applied are less prone to this condition.

Wine chemistry

The chemical analysis of volatile wine components and their relation to wine quality – The bouquet of the wine contributes a great deal to its quality. Chemical analysis of quality factors is exact and can be repeated, unlike organoleptic judging. Bouquet components regarded as quality factors are therefore analysed and will be used to verify organoleptic judging and to determine the effects of trial treatments.

Two volatile bouquet components are being investigated at present.

The automation of must and wine analyses – Because the chemical determinations that have to be carried out on the test material are time-consuming, these analyses are being automated. With the aid of this technique routine determinations can be done 10 to 20 times as fast and trials can therefore be planned on a far larger scale.

A determination method has been developed by means of which total sulphur dioxide in red and white wines can be determined accurately at a rate of 20 samples an hour. An analytical method for determining total sulphates in wines has also been developed and is used to check the sulphate content of South African wine, as well as to determine sulphate formation in fermentation trials. Ten analyses an hour can be done.

A manual method of determining amino nitrogen was adapted for automation and it will be possible to carry out determinations at a rate of 20 samples an hour.

Determining the degree of ripeness for pressing – An excellent light white wine was made in 1971 from grapes at 15°B during an investigation into the optimum stage of ripeness. In 1972 the optimum quality (with skin contact) was attained at 20°B. The study was this year repeated for the last time in the same vineyard. Optimum ripeness will again be organoleptically judged this year.

The investigation into standards of ripeness showed that sugar content alone does not consistently indicate the optimum standard. The sugar:acid ratio also differed with regard to the optimum ripeness. Indeed, this stage was reached at 1,2 in 1971 and at 2,2 in 1972. In the free-drained must series the sugar-malic acid ratio gave the best wines at a value of 3,25.

The must of the grapes that gave the best quality wine in 1971 with free drainage, contained the least polyphenols. In 1972 the best quality wine was also obtained at a polyphenol low. However, the results were not as clear as in 1971.

Increasing the percentage of good wine that can be recovered from must – A survey of the problems experienced by co-operative wineries showed that the great loss of good wine owing to the removal of the thick must sediment during the application of the sedimentation techniques is considered to be of paramount importance.

Healthy Steen grapes were used to determine whether centrifugation, rather than settling the must, has an adverse effect on wine quality and whether must with no sediment or with less sediment would give wine of a significantly lower quality than pure settled must.

The measurement of the oxygen content of the musts before fermentation showed that the oxygen in both French and Steen is slightly higher in the settled must and the mixtures than in the centrifuged must.

Oenology

A total of 363 experimental wines, including 149 white and red variety wines, were made in the research wineries at Nietvoorbij during the 1973 vintage. In order to ensure reliable results, all experimental wines were made in duplicate again this year.

Steen, Colombard and St Emilion are being used in a trial to determine the effect of transport on grapes and on the wine made from them. Steen is the cultivar most commonly planted by wine farmers, and Colombard and St Emilion were chosen on account of their differences in berry hardness and juice content. Wines from these cultivars were made in duplicate after the grapes had been transported 250 km. Control wines were made from the grapes of the same cultivars that had not been transported.

Visual evaluation of the grapes before and after transportation was done according to a points system. Crushed grapes were also included in this trial in order to establish the effect of skin contact during transportation on the quality of the wine.

The grapes were transported over a distance of 180 km during the night, which allowed them to cool down considerably. The Steen grapes were given higher marks after transportation because the cold made the bunches look fresh.

There was little difference between the quality of the Steen grapes before and after transportation. The St Emilion grapes dropped a great deal in quality after transportation and produced wine of correspondingly low quality. Crushed St Emilion grapes which were transported gave better wines than grapes of the same cultivar transported in bunches.

In the following table total must recovery from heated skins, with and without enzyme treatment, is compared for the cultivars Pinot noir, Hermitage and Cabarnet Sauvignon.

The effect of enzymes on the must recovery from heated skins of the cultivars Pinot noir, Hermitage and Cabernet Sauvignon, per ton:

Cultivar	Control	+ Enzyme	Difference
Pinot noir	6,70	6,72	+0,02
Hermitage	6,13	7,45	+1,32
Cabarnet Sauvignon	6,01	6,79	+0,78

In each case the must recovery from enzyme-treated heated skins showed an increase over the control. Slimy, fleshy skins, such as the enzyme-treated skins of the cultivar Hermitage, yielded 1,32 hectolitres per metric ton more juice than the untreated control.

Pinot noir, the skins of which are not at all slimy, gives a relatively low must yield with enzyme treatment.

CITRUS

Of the 726 400 young citrus trees available in registered nurseries during the past season, most (373 200) were grown in the Transvaal, and the second largest number (276 900) in the Cape Province.

Breeding and selection

Since black spot is of great commercial importance to the South African citrus industry and the bitter orange *Citrus aurantium* is resistant to infection with this fungus disease, breeding for resistance to black spot was started. There are a number of trees in bearing at the Citrus and Subtropical Fruit Research Institute which are crosses of bitter orange with sweet orange, grapefruit, or other varieties.

Most of these crosses show no symptoms of black spot, although the trees are surrounded by trees seriously infected with this fungus.

With one exception, however, the fruit is completely inedible. That exception is a bitter orange x grapefruit cross which is edible, despite a slightly bitter flavour. This is an indication that the second generation may possibly yield crosses of commercial value.

Cultivar studies

As in the case of rootstock trials, a number of navel, grapefruit, Valencia and lemon cultivars were planted out at Addo, Buffelspoort, Burgersfort, Makatini and Friedenheim.

The trees were all grown at Addo and transported to the various sites. Despite the long distance they had to be transported, virtually no deaths occurred and only 5 trees will have to be reset. It is already clear, however, that the Addo Cecily grapefruit is very delicate.

The Ellendale mandarin

Judging from the results obtained during the past season, the Ellendale mandarin should not produce insufficient fruit on account of pollination problems. This cultivar is self-compatible and shows a fairly high fruit set after self-pollination, with a relatively low average seed content of about four seeds per fruit.

Ortanique

According to trials carried out in Swaziland, the Ortanique cultivar is not self-compatible. However, fruit set and seed content are greatly increased by cross-pollination with several pollen sources.

During the past season attention has been paid to pollen sources which produce a relatively low seed content in Ortanique fruit, but nevertheless stimulate fruit set. According to these trials the interplanting of Ortaniques and Valencias leads to a commercially significant increase in production. This fruit has an average seed content of only 3,0.

Washington navel

Pollination – A navel orchard near Malelane, in which the effect of natural cross-pollination on grapefruit can be investigated, was placed under observation. It could not be established that natural cross-pollination had any favourable effect on navel production. Only 7 per cent of the fruit of the navel trees that were surrounded by grapefruit trees contained seeds (usually one seed per fruit). However, grapefruit has one of the lowest pollen germinations of all citrus cultivars, generally under 1 per cent. These results were discouraging.

Growth regulators – In previous trials it was found that navel fruit set is increased dramatically if gibberellic acid is applied direct to flowers and young fruit. But it was also found that spraying gibberellic acid on to the whole tree does not increase the fruit set.

Consequently attention was given to trunk applications of this growth regulator. A small syringe was designed with which injections can easily and cheaply be given.

It was established that gibberellic acid applied to a citrus tree in this way spreads very rapidly through the tree. For instance, within six hours of the application of 75 mg, the gibberellin concentration had risen from 130 to over 13 000 micrograms per gram in young leaves. From the results obtained in the course of several trials, it appears that gibberellin injected into the trunk is far more efficiently absorbed by the tree than in the case of tree sprayings.

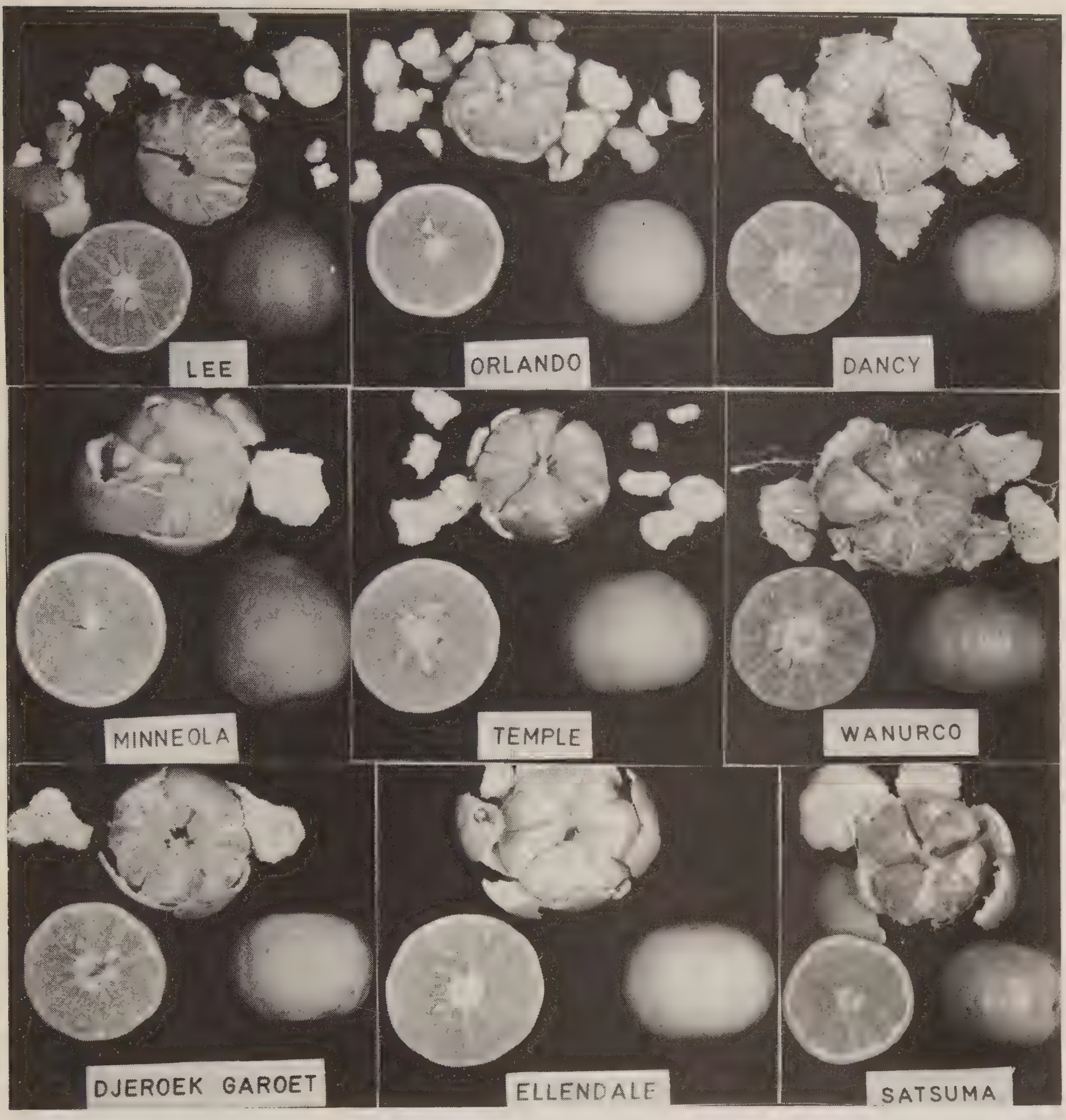
Rag strength – Studies of the rag strenth of midseason cultivars on two rootstocks showed that the rag strength varies between 3,2 and 5,8 kg.

There is a tendency for cultivars on a sweet orange rootstock to produce fruit with a softer rag than those grown on a rough lemon rootstock. The most important results are a downtrend in rag strength in the course of a single season.

Early in the season the rag of the smaller fruit is softer, but the difference diminishes as the fruit ripens.

Fruit from Addo had the softest rag and fruit from Friedenheim the toughest.

Early, mid and late season citrus fruit was obtained from various overseas countries and compared with regard to rag strength.


LEE
ORLANDO
DANCY
MINNEOLA
TEMPLE
WANURCO
DJEROEK GAROET
ELLENDALE
SATSUMA

Various citrus cultivars which peel easily

The rag strength of citrus fruit from various countries (offered on the London market)

Country	Rag strength (kg)		
	Early	Mid	Late
The Americas	8,4	7,5	6,9
R.S.A.			
Summer rainfall area	8,2	6,4	6,4
Winter rainfall area	6,9	6,8	5,1
The Mediterranean	4,6	4,4	4,5

The following conclusions may be drawn from the table:

Rag strength declines as the season advances.

Fruit from the Mediterranean and the winter rainfall regions of South Africa has a softer rag than fruit from America and the summer rainfall areas of South Africa.

A highly significant correlation was found between seed content and rag strength: the rag of fruit with no or

A four-year-old Valencia tree in production. About 100 kg of fruit is produced at this stage. A plastic surface cover is used under these trees

very little seed was considerably softer than that of fruit with a lot of seed.

Rag strength determinations were carried out on fruit samples from 10 different areas of the Republic. The rag strenth varied from as much as 12,0 kg to as little as 3,8 kg. The lowest average rag strenth was found in Addo and Citrusdal fruit, and the highest in Letsitele fruit.

The research on rag strength is opening up a whole new field and could be very important in evaluating new and old selections, rootstocks, suitable cultural practices for citrus, and other factors that may affect fruit quality.

Nursery techniques

During the past year a new budding technique was investigated and tested at a nursery. The so-called micro-budding technique entails the cutting of very young buds which are then established on very young rootstocks by means of shield budding. This technique is being applied very successfully and the figures for the commercial nursery show over 90 per cent success.

The chief advantages of the technique are:

(1) Up to 2 000 buds can be cut from a single parent tree.

(2) Considerably fewer parent trees are used and a more uniform progeny is consequently obtained.

(3) Once mastered, the technique is as quick as or even quicker than the old T-method.

(4) The bark does not have to slip before budding can be carried out.

(5) Considerably younger rootstocks are used for budding and consequently the tree can leave the nursery far sooner.

Soil fumigation

Three preparations were tested in order to evaluate the re-use of old nursery soil and determine the effect of certain preparations on weed growth.

It was found that fumigation with methyl bromide was the most effective for promoting the growth of citrus seedlings and that it suppressed weed growth to a fair degree.

Soil mixtures

To ensure optimal growth in the nursery, it is sometimes necessary to use soil mixtures instead of ordinary soil. A variety of anorganic and organic products were used for mixing with soil used in the nursery containers. The following media were tested:

Sugar filter-press, building sand, vermiculite, Kulite sawdust, peat moss, wood shavings and charcoal gravel.

The products were mixed with loam in many different proportions.

The most promising results were obtained with 2 topsoil: 2 sugar filter-press: 1 building sand. The mixture 1 topsoil: 2 sugar cane-waste also gave good results.

Nursery inspection

During the past year all the major citrus nurseries were visited and their general practices investigated. With the exception of about 10 nurseries, the general state of affairs is disturbing.

It was clear that there was very poor contact between the research workers and the nurserymen and that many nurserymen had very little knowledge of cultivar problems.

The parent tree registration programme, which was approved in principle and is at present being launched, ought to improve matters considerably.

Cultivation and fertilising

The effect of various cultivation treatments on the growth of four-year-old Valencia trees was investigated. The effect on tree volume was striking. Where the soil was left undisturbed and there was little competition from weeds (owing to the use of a plastic cover, or weedicide, or plastic plus a dead grass mulch) the trees were about 15 to 20 per cent bigger than where the soil was disturbed or where there was a grass culture in addition to a dead grass mulch, and 50 per cent bigger than where mechanical disturbance of the soil had taken place or where there was grass competition.

The effect of various treatments on the production and fruit size of Valencias was also investigated. On *four* of the plots there was no weed competition, owing to the use of a plastic cover, a weedicide, weeding, and a plastic layer plus a dead grass mulch. The production of the trees on the plot with a plastic cover was 66 kg per tree, as against the production of 55, 48 and 36 kg per tree respectively in the other three cases. These good production figures are ascribed chiefly to moisture conservation.

The production of the trees on the plot with a grass culture was 17 kg per tree. In this case the difference is ascribed chiefly to weed competition.

Despite the big differences between treatments with regard to production, there were no measurable trends in the size of the fruit. This shows that the favourable effect of the treatments on production did not go hand in hand with a reduction in fruit size. The trees therefore did not over-extent themselves in producing these big crops. Trees that set heavy crops under less favourable conditions usually have undersized fruit.

The effect of soil cultivation on the nutritional status and the pH of the soil was also investigated. At this stage the most important conclusion is that the use of a plastic cover does not in any way impair the availability of nutrients.

There is decided competition between grass and the tree for nitrogen, as is evident from the lower nitrogen values where a grass culture is used.

An interesting pehnomenon, which repeats itself year after year, is that the potash value in leaves is slightly lower in trees receiving the plastic cover treatment than in trees receiving the other treatments.

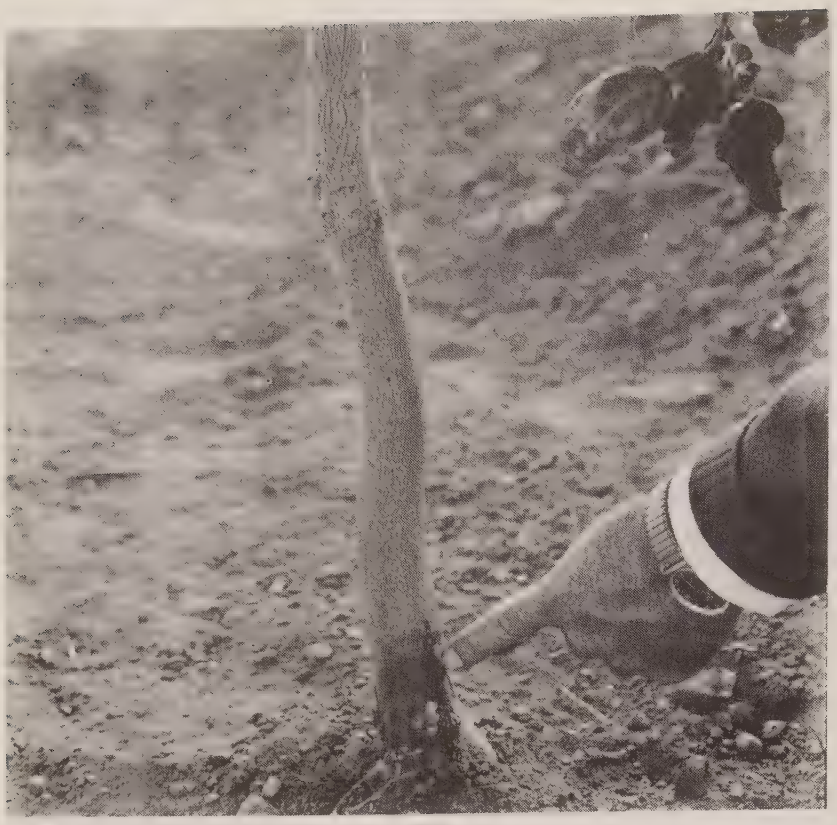
A further trial was carried out to determine the effect of the three cultural methods on soil moisture evaporation. The three treatments were the following:

A plastic cover like those used on tree plots; undisturbed, uncovered soil; and, thirdly, disturbed soil. (The topsoil was loosened by mechanical means to a depth of 25 mm every 14 days.)

It was striking that the disturbed layer of topsoil had no advantageous effect on soil moisture evaporation. Indeed, the disturbance of the topsoil appeared to stimulate moisture loss to a depth of 225 to 300 mm.

Four months after the start of the trial 61 mm of rain fell. This moisture penetrated to a depth of at least 300 mm. For a short while the plots not covered with plastic had a higher moisture content than the plastic-covered plot. However, the difference disappeared within two weeks, at which stage all the plots contained the same amount of moisture.

The structure of the soil in the trial orchards was studied after the plastic covers had been used for a period of three years. A very good crumb structure was observed. There were no visible signs of compaction or compression. The soil was a porous, crumbly medium that created ideal conditions for root development. Feeder roots were found in masses in the upper 50 to 60 mm of soil and the roots were very healthy and vigorous.



Collar rot on the stem of a young citrus tree, due to *Phytophthora atrophthoria* or *Phytophthora parasitica*. Symptoms appear as grey-black areas on the stem just above the soil line and are usually accompanied by gainning and cracking

The effect of a plastic cover on soil temperature was noted daily at 08h 00 and 14h 00. THe soil was an average of 1°C cooler under plastic at 14h 00 and 1°C warmer at 08h 00.

The plastic-covered plots showed that weeds can be very effectively controlled by this treatment. It also saves labour.

Chemical weed control

Glyphosphate gave promising results. This is a contact preparation that is absorbed and translocated by the plant and kills it. It takes from 3 to 6 weeks to kill a plant. About two weeks after spraying the seed of the weed germinates again and grows. Glyphosphate therefore has a very short residual effect, and this has decided advantages.

Glyphosphate controls most grass species and other weeds.

Replanting

It was conclusively shown at Addo in the Eastern Cape that deep ploughing prior to replanting has a very favourable effect on the growth of young trees.

Cultivation and fertilising

Three trials are at present being carried out at Kaapmuiden, Hazyview and Pongola in order to determine the response of grapefruit trees to nitrogen, phosphate and potash fertilising. It was only at Hazyview that the yield was affected. In this case a potash response was obtained as expected, because the exchangeable soil potash was very low.

Phosphate application tended to reduce the yield at Kaapmuiden and Pongola. Nitrogen applications at Kaapmuiden and Hazyview tended to raise the yield.

Few constant effects were observed with regard to quality properties in these trials.

A preliminary survey of the magnesium status of citrus orchards showed that the magnesium content of soils in certain areas of the Lowveld has dropped considerably during the past three seasons. Magnesium deficiencies are particularly common in the Nelspruit, White River, Karino and Hazyview areas. This problem is being investigated at present.

Diseases and pests

While making an electron microscopic study of the greening pathogen in the insect vector, the citrus psylla, research workers ascertained that, unlike the other plant pathogenic mycoplasma-like organisms which are bounded only by a simple unit membrane, it is bounded by a complex envelope resembling the cell wall of gram negative bacteria.

After consideration of the pathogen's morphology, ultrastructure and the situations in which it occurs, they have concluded that it is not a type of mycoplasma, as originally thought, but can more correctly be classified among the gram-negative bacteria.

This is believed to be the first record of a bacterium-type plant pathogen that also multiplies in the circulatory system of its insect vector and will be of great importance in finding measures of controlling the disease.

Reports have been received of a severe gumming and dieback of citrus in nurseries and certain established orchards in the Transvaal and Eastern Cape citrus areas. During a visit to the infected citrus areas, it was found that approximately 20 per cent to 30 per cent of trees in some young plantings (mainly oranges and grapefruit on rough lemon rootstock) showed signs of infection and gumming. In one 18 year-old grapefruit orchard in heavy soil, the disease incidence was in excess of 80 per cent.

Symptoms first appear as darkened grey-black areas on the stem just above the soil line. This is usually accompanied by small cracks and spots of yellow-orange gum. In cases where the infection has advanced to girdle the stem the tree dies back rapidly, frequently with a crop of fruit clinging to the bare withered branches.

The use of calamondins as fruit traps to recover various *Phytophthora* species from the soil proved very effective.

Results from the isolation showed the presence of either or of both *Phytophthora citrophthora* and *Phytophthora parasitica* from the diseased bark, roots and infested soil. Both of these pathogens are associated with the collar rot and root rot syndrome in various citrus-producing countries of the world.

A seed bed fumigation trial using various nematocides is being carried out for nursery purposes. Twelve different fumigants are being tested in a sandy soil.

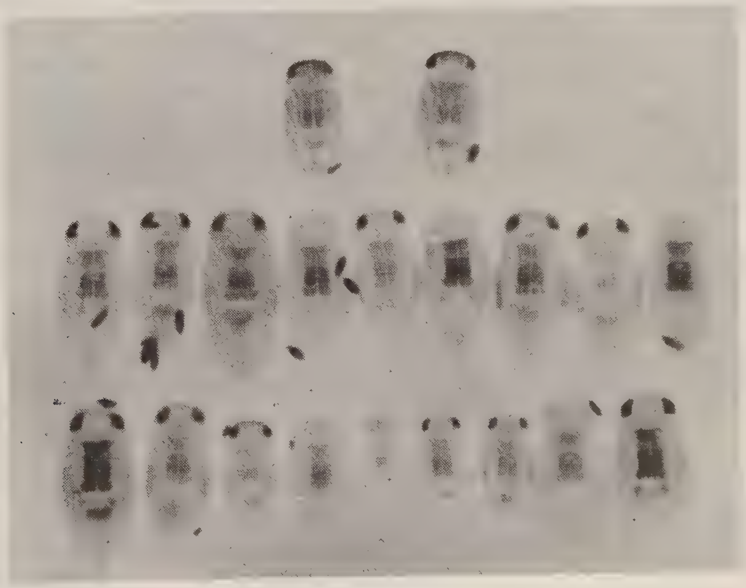
Nematode counts, 12 months after the sowing of the seed, clearly showed that the fumigants DBCP, DD, Telone, Di-Trapex, methyl bromide and EDB applied before the sowing of the seed provided good nematode control. Of the past-sowing fumigants Nemacur gave the best control and Temik gave fair control of nematodes.

Various field trials were also carried out and the results indicate that DBCP (dibromochloropropane) and the new preparations Mocap and Nemacur, which are applied in granular form, are excellent for controlling citrus nematode.

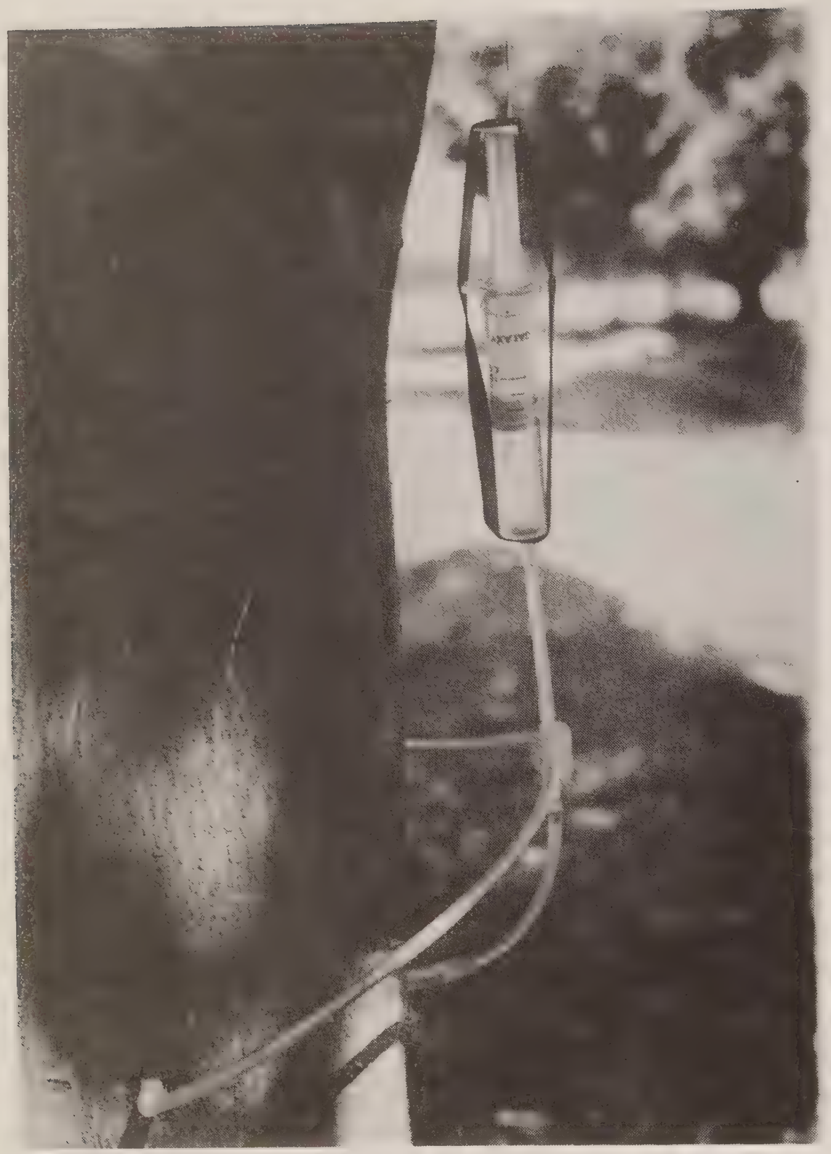
A preliminary survey shows that two of the imported red scale parasites, *Aphytis melinus* and *Aphytis* (near) *lingnanensis* are already well established and distributed in the Lowveld of the Transvaal. The former also occurs in Zululand. Better results with the biological control of the red scale *Aonidiella aurantii* (Mask.) could be obtained in the Lowveld as well.

Comperiella bifasciata (How.), which is another imported parasite of red scale, now occurs at Malelane, White River, Zebediela and Citrusdal. It is still too soon to determine the real value of this parasite.

Various pesticides are being tested in citrus



Two pupae (top row) of the indigenous parasite *Aphytis africanus* which attacks the red scale insect, compared with pupae of the imported parasite *Aphytis melinus* which is now found in citrus orchards in the Lowveld



A stem injection apparatus used for administering gibberellic acid to citrus trees

orchards in an investigation into the effect of pesticides on the integrated control of citrus pests. Usually 2, 3, and 5 sprayings are applied in order to test the effect of biological control on the various pests. Abate, at the new low dosage, encouraged red scale. HOE 2960, a new preparation for the control of citrus thrips, showed no harmful effects.

The use of Abate caused infestations of soft brown scale *Coccus hesperidum* L. and consequently a great deal of sooty mould and citrus red mite *Panonychus citri* (McGr.). An increase in the incidence of false codling moth *Cryptophlebia leucotreta* (Meyr) is another possible consequence of using Abate.

The tendency of some pests to multiply after an application of a certain insecticide emphasises the necessity of being more selective in the choice of an insecticide for the control of a particular citrus pest.

HOE 2960 gave good results against citrus thrips *Scirtothrips aurantii* Faure. Dimethoate was not so effective and a low dosage of this preparation caused a severe increase in red scale in orchards under integrated control. Omethoate was better than dimethoate, but also encouraged red scale.

Harvesting and handling

Low-temperature sterilisation of insects in packed citrus fruit is already being applied, but investigations into the technique were continued in order to effect even better control over cold damage. The Washington navel is one orange cultivar that still suffers a great deal of damage when stored at –0,5°C for sterilisation. Trials over the past four years showed that pock-marked peel was more frequent than rind stain. Rind stain also improves if the oranges are left at 21°C for a few days.

However, if oranges are stored at –0,5°C for 12 days for sterilisation against fruit fly alone, and then shipped at 4,5°C, the cold damage is kept within limits and navels of good quality can be exported to Japan.

Similar findings were obtained with grapefruit from the Sundays River in 1972. When the grapefruit was stored at –0,5°C for 12 days only, cold damage was very low. It increased rapidly, however, if that period was extended. The temperature at which the grapefruit was shipped was 11°C. A continuation of trials with controlled wilting showed that cold damage can be kept even lower by allowing wilting to take place prior to sterilisation.

For reasons connected with marketing, grapefruit is stored on an increasingly large scale. It has already been necessary to prevent the build-up of high concentrations of carbon dioxide in cold stores, in order to prevent internal damage. It has now been established that concentrations of 1 per cent of carbon dioxide gas in the storage atmosphere for up to three months are harmless to grapefruit.

SUBTROPICAL FRUIT

New plantings of virtually all kinds of subtropical fruit are still being established in the Eastern Transvaal, but the chief crops being planted are avocados, mangoes, and pecan and macadamia nuts.

In order to prevent local markets from being oversupplied in times of surplus production, considerable quantities of fruit, particularly avocados, are already being exported.

Avocados

Last year 10 330 metric tons of avocados were marketed. Of this quantity 7 320 tons were sold locally, 2 850 tons were exported by air and 160 tons by sea.

These figures are indicative of a rise in production of 20 per cent as against production during the previous season. The export percentage of 29 per cent was the same as in 1971. The swing in favour of air transport continued; the figure was 5,4 per cent in 1972 as against 1,1 per cent in 1971.

An increase of 50 per cent in tree numbers is expected in the Eastern Transvaal within the next four or five years. At present there are about 160 000 trees planted in the vicinity of Tzaneen and about 175 000 in the southern part of the Eastern Lowveld.

Cold storage in the course of exporting was bedevilled during the past year by an apparent increase in the sensitivity of the fruit to damage by low temperatures. The damage takes the form of black to dark brown spots on the skin, but the flesh is not directly affected. It has been established that skin damage can be prevented by raising the storage temperature slightly.

A number of different types of flesh discoloration also seriously impaired the marketability of the fruit.

Gamma irradiation holds little promise for increasing the post-harvest life of the fruit. In general, avocados are highly sensitive to this type of treatment and show intense browning of the flesh even at low dosages.

Diseases and pests

The chief production problem is still the rapid deterioration of avocados orchards, chiefly as a result of root rot caused by *Phytophthora cinnamomi*, virus sun blotch and possibly a graft union problem.

The chief cause of the virus sun blotch problem is the use of symptom-free carriers of the virus, particularly rootstock material, which are infected with this virus but show no symptoms.

In an attempt to solve this problem, seed and graftwood from indexed sunblotch-free trees are made available to growers and farmers so that they can have their own source of virus-free material available for use as parent trees.

An indexing scheme aimed at declaring parent trees free of sunblotch virus is planned. Research aimed at finding a suitable indicator source is being carried out at present.

The pine thrips or greenhouse thrips *Heliothrips haemorrhoidalis* was found on avocados in South Africa for the first time. The insect lays its eggs under the epidermis of the leaves. The damage to the fruit consists in flaking of the skin, which later turns brown and spoils the appearance of the fruit. The cacao thrips *Selenothrips rubrocinctus* also damages the fruit. The economic importance of the pest has still to be established.

In the Tzaneen area a spotting on avocados has resulted in export losses in certain seasons. The disease is referred to by growers in that area as Phomopsis spot. Symptoms of the disease appear as small, raised, black shiny spots which later increase in size, but seldom become larger than 3mm in diameter.

Certain Tzaneen avocado growers have reported export losses due to this disease as high as 80 per cent from April to July 1973. Following the heavy rains during the 1971/72 season, this disease has spread alarmingly through many avocado orchards in the northern Transvaal.

Fortunately the disease can be easily controlled with regular applications of copper fungicide, mancozeb or captafol, applied every 3 to 4 weeks, from fruit set September to February. However, a single application of benomyl with orchex oil (½ per cent) or periolene applied in mid-December followed by mancozeb or copper oxychloride in mid- February resulted in over 95 per cent exportable fruit compared with 24 per cent for that in the untreated control.

Anthracnose *Colletotrichum gloeosporioides* was also effectively controlled by the latter treatment viz. 61 per cent exportable fruit compared with 29 per cent for the untreated control. This is very encouraging since all attempts to control anthracnose using post-harvest treatments have failed. It appears that well-timed pre-harvest sprays with a suitable fungicide will effectively control both these diseases.

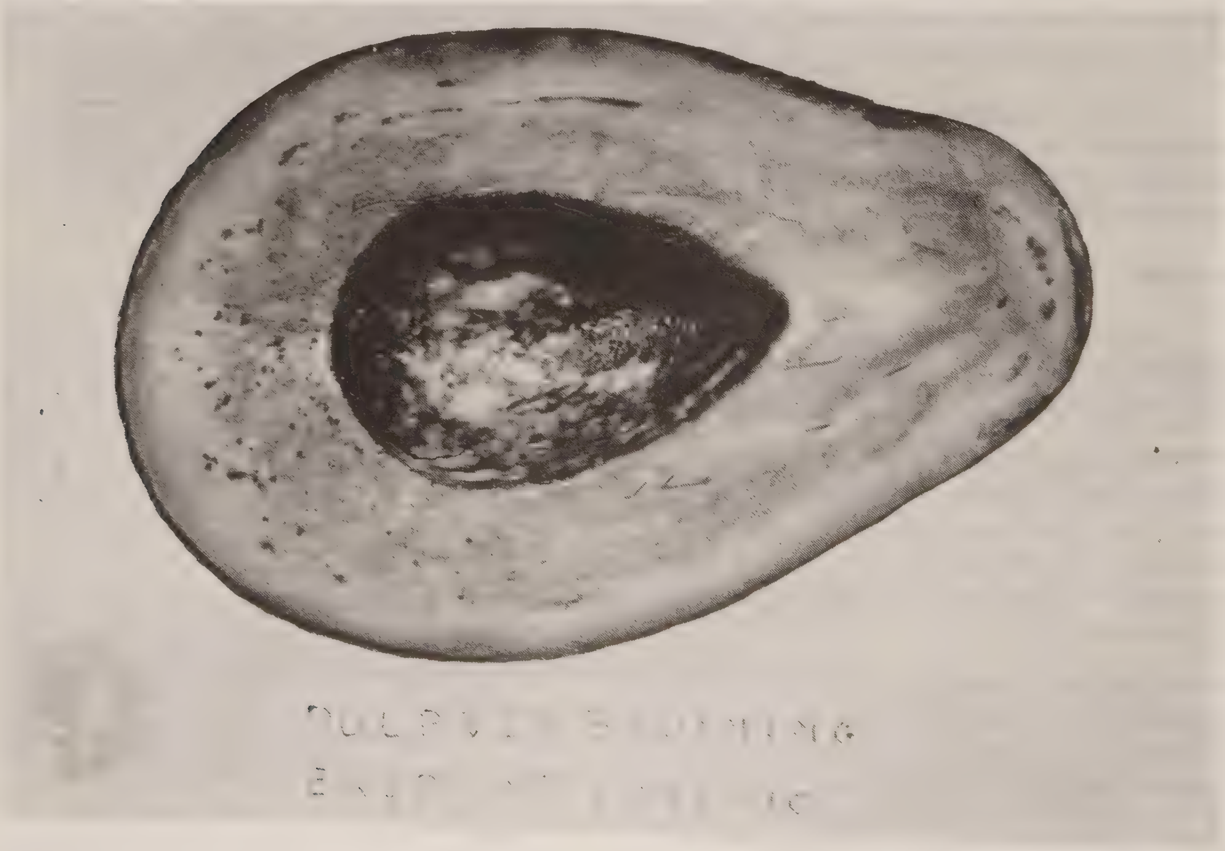
The Plant Pathology section at the Citrus and Subtropical Fruit Research Institute in co-operation with a firm specialising in aerial photography is continuing with investigations for the detection of avocado root rot in avocado orchards.

Using the multispectral technique 100 of the diseased trees were correctly classified when compared with the ground truth. There was also a distinct indication of a pre-visual detection of this disease using this method. The advantages of this for the grower are obvious since steps could be taken in time to curb the disease development before it has had time to spread.

Fertilising

Research on the fertilisation requirements of avocado trees shows that this type of fruit needs very little fertilising on fairly fertile soils. Four-year-old trees produced the excellent yield of 85,5 kg of fruit per tree without any fertilising. This production was accompanied by leaf analysis results for nitrogen, phosphate and potassium, which fell within the optimal norms.

Increased nitrogen application produced no improvement in the yield, and phosphate applications reduced the yield. Potassium applications tended to lead to higher production. Nitrogen and potassium increased the oil content of the fruit.

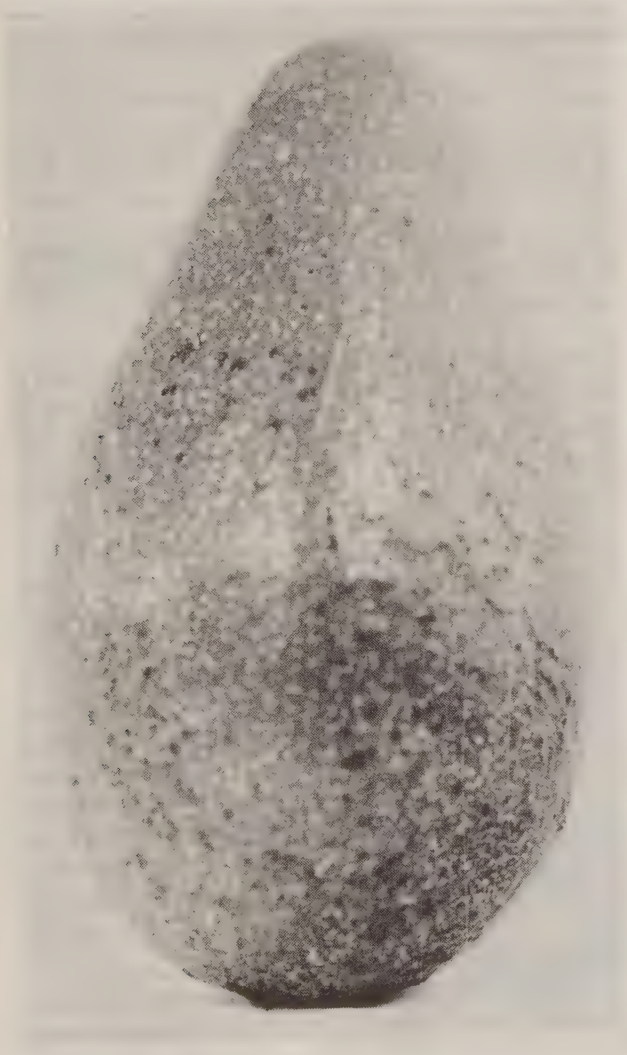


Pulp browning in avocados as a result of gamma radiation

With the aid of pot trials it was also shown that the best root development and aerial growth in avocado seedlings are obtained when the pH of the soil is over 6,0, but below 7,0. However, suppressed zinc and manganese absorption by the plant was found in soil with this pH.

During the 1973 season soil and leaf samples from 80 orchards were sent in by avocado farmers for analysis. The results show that this service is of great value to the producer. The vast majority of orchards used to receive excessively high applications of nitrogen a few years ago, as the leaf analyses showed, but drastic adjustments were made and this year there were only a few cases of high nitrogen content in the leaves. What is more, this considerable saving on the cost of fertilising was accompanied by increased production in most cases.

In quite a number of cases zinc and boron sprayings, carried out when analyses showed low values, produced unexpectedly good results. Orchards that had deteriorated a great deal recovered to a remarkable extent within a few months.



The small, raised, shiny, black spots on avocado fruit are referred to as *Phomopsis* spot

Bananas

A leaf analysis service for banana producers was instituted at hte beginning of the 1972 season. During the past season 171 leaf samples and 130 soil samples were analysed for farmers. The largest quantity of samples came from the Burgers Hall area, followed by Natal and Levubu.

In future this service will be offered annually by the Citrus and Subtropical Fruit Research Institute.

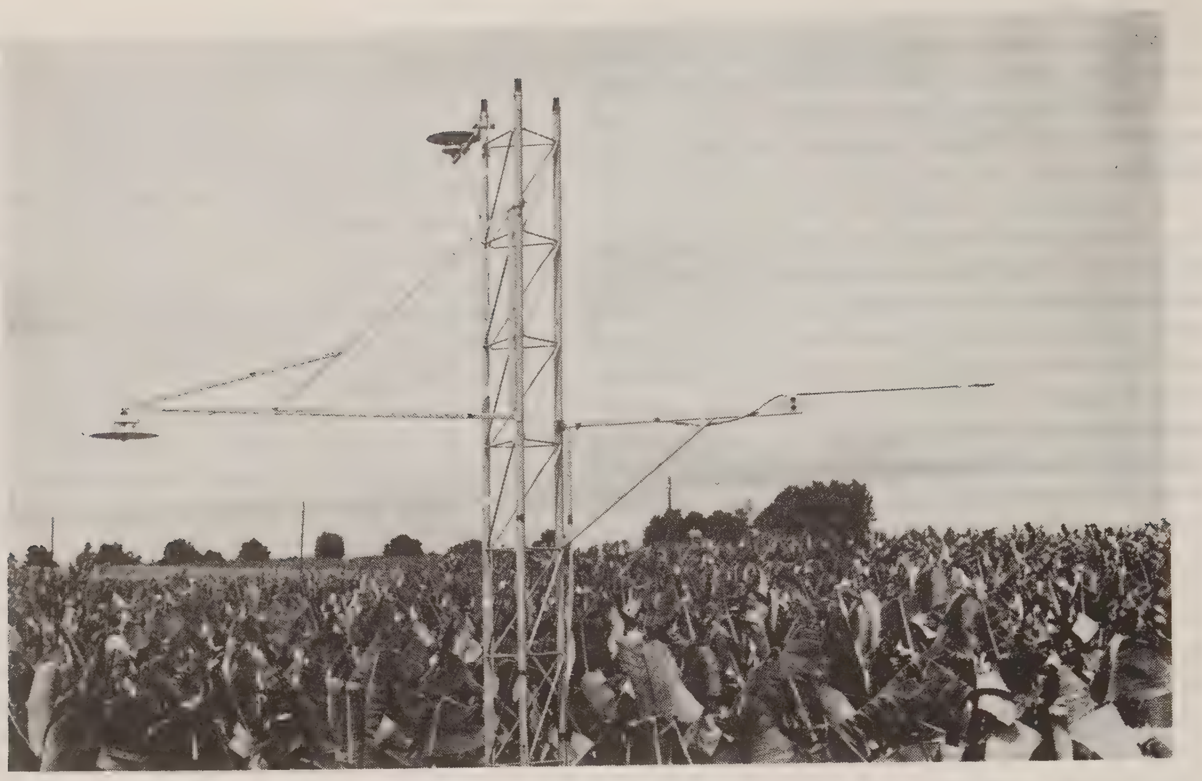
Good prices for bananas during the past six months led to further plantings, particularly in the Burgers Hall/Kiepersol and Levubu areas. The area under bananas in the vicinity of Levubu will increase by about 12 per cent.

Promising Cavendish selections are still being collected for evaluation, in an attempt to find one that is better than the present Dwarf Cavendish type. One of the seven selections being tested on a bigger scale is considerably better than the Dwarf Cavendish. It is now being multiplied for final tests prior to possible release.

Promising results were obtained by covering bunches of bananas with blue polyethylene bunch covers during the winter. This ensures more rapid development of the bunch and less fruit damage. There is still one problem, however, viz sunburn, and in order to control it paper should be placed between the bunch and the cover, on the sunny side. Further tests are being carried out with various thicknesses of blue, in order to control sunburn without using paper.

Leaf analyses aimed at determining the fertilisation requirements of bananas show that the midrib portion of the third youngest leaf is the most suitable part of the plant for analysis, particularly for macro-elements. The time of sampling is also very important: the flowering stage during February/March appears to be very suitable. It was found that too high a phosphorus content in the soil and plant reduces the yield. But it was also found that phosphorus is particularly important for new plantings and is essential for the growth of young plants. Soil analysis also show that the exchange capacity of the soil has to be at least 60 per cent saturated with calcium if the maximum yield is to be obtained.

Peeled bananas should be sulphured prior to dehydration in order to prevent darkening during dehydration and storage. Exposure to sulphur dioxide fumes for 15 minutes yields a dried product with about 400 ppm of sulphur dioxide and after 30 minutes' exposure the sulphur dioxide content is 1 700 ppm. At 32°C bananas containing 1 700 ppm of sulphur dioxide were still acceptable after 10 weeks, whereas those containing 400 ppm of sulphur dioxide were too dark



The measurement of solar radiation components over a banana plantation at the Burgershall experimental station

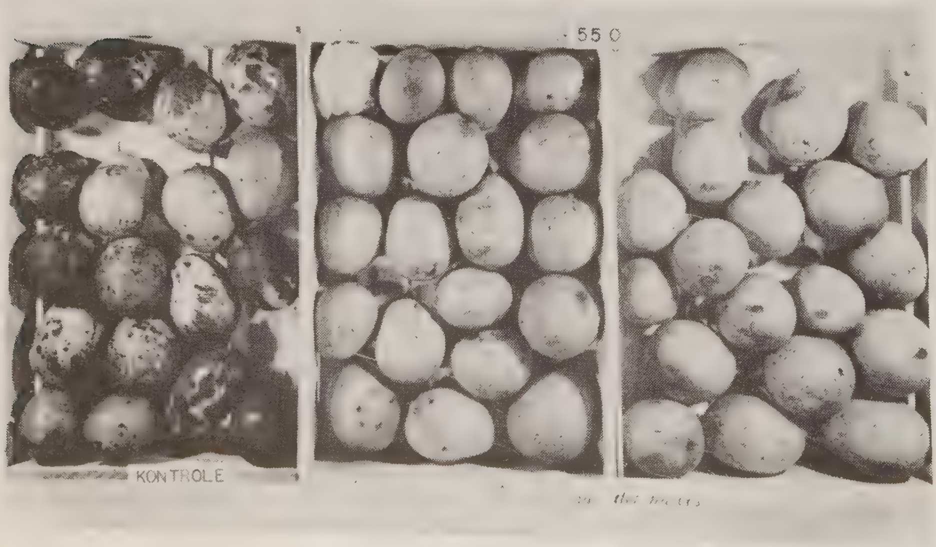
after 6 weeks. At a storage temperature of 10°C, however, darkening is very slow, even in the unsulphured product.

Mangoes

Mango production and consumption by the fresh fruit market and canning factories are continuing to increase every year. Producers are becoming more quality-conscious, and more and more attention is being given to new techniques for treating fruit, as recommended by the Citrus and Subtropical Fruit Research Station.

The new fibreless cultivars are now being planted in larger quantities than the old stringy cultivars Peach and Sabre.

Planned plantings in the Lowveld are estimated at about 240 000 trees, and an increase in production of about 300 per cent is expected during the next five years.



The effect of heat treatment on anthracnose in Peach mangoes: the fruit on the left was not treated. All the fruit was photographed 10 days after harvest

Diseases and pests

Spray experiments aimed at the control of mango bacterial spot disease *Erwinia mangiferae* indicate that the efficacy of copper oxychloride can be increased by the addition of a residue extender (Pinolene).

By bagging the fruits on the tree at various periods from fruit set to maturity it was possible to establish that during the 1972/73 season there was no bacterial infection in a mango orchard in the northern Transvaal before 17 October 1972. A slight increase (3,6 per cent fruit infection) occurred up to the end of November while in December and January there was a marked increase in disease incidence.

It is expected that this disease pattern will change according to distribution and extent of rainfall in a particular season.

In South Africa severe losses of mangoes, due to a soft brown rot, have been experienced where fruit has been kept in cold storage for prolonged periods. This disease is very important since up until the present, fruit can be exported most economically to Europe by sea which involves storage at 10°C for approximately 14 days. Unfortunately these appear to be ideal conditions for the development of soft brown rot disease. Recently with two large consignments of mangoes by sea to England losses as high as 80 per cent were experienced due to this disease. Unless this problem is solved, export of mangoes from South Africa by sea cannot be considered in future.

Fruits were artificially infected with cultures of the fungus. Within 4 days after inoculation all infection sites were positive i.e. from brown rot, which later darkened. Re-isolations gave cultures identical to the original isolates.

The fungus has been identified as *Hendersonia creberrima* which was described from mango fruits in Pusa, India, in 1916.

Heated benomyl resulted in a very satisfactory control of this disease. In the one experiment fruit was kept for 23 days after treatment (14 days at 10°C and 9 days at 20°C, to simulate shipping and marketing conditions) and only 24 per cent of the untreated fruit was marketable compared with over 95 per cent for that of the hot benomyl treatment. This treatment has now been registered for use as a post-harvest dip on mangoes in South Africa.

Bark cracking of mango trunks is common at present. A recent investigation shows that up to 80 per cent of the trees in certain orchards show these symptoms. This condition may even occur in young seedlings. No rot or break-down of tissues is found in the affected parts. The cause has not yet been established with any certainty.

Jelly seed in ripe mango fruit causes a great deal of spoilage and loss. A biochemical investigation into the nature of this condition showed that it is chiefly a physiological ripening problem and is found to a greater or lesser extent in all cultivars when the fruit is left to ripen on the tree.

Fertilising

During the 1972 season the Citrus and Subtropical Fruit Research Institute started soil and leaf analyses for mango farmers. This met with a favourable response from farmers, and samples were received from 68 orchards.

The most striking fact revealed by this survey was that a large number of the orchards were not fertilised. The analyses showed that most of these orchards needed fertilisation. Only about 7 per cent of the orchards were getting the correct fertilisation. In about two thirds of the orchards the nitrogen applications had to be increased, and in one third of the cases potassium applications had to be increased as well.

In about 20 per cent of the orchards applications of certain elements had to be reduced. The investigation revealed that mangoes need relatively little phosphate.

Pawpaws

There was an increase in the marketing of the smaller hermaphrodite pawpaws Solo and Sunrise-Solo, which were imported from Hawaii and are produced chiefly in the Tzaneen district.

A heavy infestation by the Natal fruit fly *Pterandrus rosa* occurred in the Letaba area this year in a selection of the Solo pawpaw. About 30 flies breed from one fruit.

According to the grower of that selection, the fruit discolours long before it is suitable for picking. This type of pawpaw ripens fairly late in the season. These two facts probably explain why this selection is so severely attacked.

Pineapples

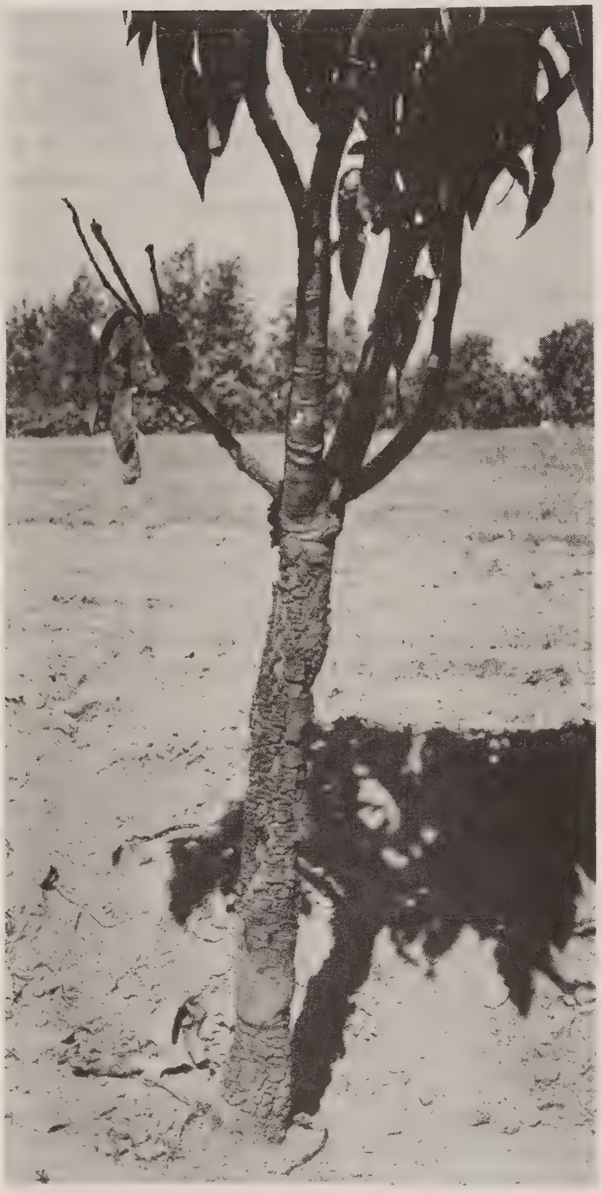
Efforts are constantly being made to improve the appearance of pineapples which are exported by sea. During packing, pineapples are treated with TBZ, together with 2,4-D, to control superficial fungal growth and improve the appearance of the crowns. Fruit treated in this way had a far better appearance after storage than fruit treated with only one of the two preparations.

Wax treatment to improve the bloom also

produced good results, except when the wax layer was too thick. However, wax treatment had to be combined with TBZ in order to control superficial fungal growth.

It was found in the course of both glasshouse and field trials that the immersion treatment of pineapple tops with the systemic nematocides Vydate and Nemacur protected the tops when planted in nematode-infested soil.

In a glasshouse trial "1410" provided protection against both spiral nematode *Helicotylenchus dihystera*, and rootknot nematode *Meloidogyne javanica* for a period of five months.



Stem cracking on a young mango tree

It was found in the course of an investigation in the Hluhluwe area that leaf and soil analyses can give a very good indication of fertilising problems. At Hluhluwe particular attention will be given to nitrogen and potassium fertilising, and to the application of the micro-elements zinc and boron.

This investigation is being extended to the Eastern Cape.

Granadillas

Further investigations with regard to the yellow granadilla show that this species also bears well in the cooler, more humid climatic zones of the Transvaal Lowveld. But there is still some resistance by processors to the yellow granadilla juice because of its poor colour and higher acidity. There is a great variation in the fruit size and taste amongst the yellow species and selection work is in progress to obtain a fruit which will be more suitable for processing.

Of the eleven hybrids that are being evaluated more rigorously only three have shown promise. These are now being multiplied so as to provide various processors with sufficient fruit for testing. Another batch of hybrid seed is being imported from Australia this season for further selection work.

Phytophthora stem rot is becoming an increasing problem of the purple granadilla and it appears that the most effective way of controlling this soil-borne fungus is by using a resistant stock. The yellow granadilla has been shown to be tolerant to *Phytophthora* and grafting of the purple on the yellow is now strongly recommended.

Soil fumigation trials show that the control of the rootknot nematode *Meloidogyne* sp. gives stronger seedlings which can be pricked out at an earlier stage. It is also clear that fumigation with Mocap, DBCP and EDB before planting time promotes normal growth and production. Over a period of three years these preparations produced 42,7 per cent, 37,85 per cent and 29;39 per cent greater crop masses, respectively, than the masses of untreated plants. Fumigation after planting time produced no statistically significant crop mass differences between the various treatments and control plants.

Litchis

It was apparent from a survey carried out in a litchi orchard of 300 trees established in the Transvaal Lowveld before 1900 that there are 12 promising types that compare very favourably with the present commercial cultivars H.L.H. Mauritius, and may even be better. However, the trees and fruit still have to be subjected to strict tests.

An investigation into the problem of fruit crack in litchis revealed that it occurs after cell division in the pericarp (skin) has ceased and cell elongation is taking place.

Litchis are especially prone to post-harvest infection by various fungi such as *Rhizopus* spp. and *Penicillium* spp. Several experiments were conducted in order to determine the most effective means of controlling these diseases. Measures which effectively reduced the extent of moisture condensation on the fruit surface and thus disease development on stored litchis were drying fruits immediately after harvest in a drying tunnel for 24 hours, and pre-cooling to 0°C and maintaining this temperature during storage and transit prior to marketing and use of well-ventilated containers, viz wooden boxes.

In these experiments only two fungicides namely Geigy E3688 and RH 893, gave effective control of the post-harvest diseases. However, the Geigy compound cannot be used because of certain side effects on fruit colour and taste.

Results obtained by storing litchis in nitrogen atmospheres and by treatment with gamma irradiation doses of 400 krads were so promising that further experiments along these lines are warranted.

The practice of protecting bunches of litchis with paper bags is becoming increasingly popular. Considerably more farmers are applying this method.

The increasing incidence of the bark borer *Salagena* sp. *(Metarbelidae, Lepidoptera)* led to a study of the biology and control of this pest. The insect was observed in plantings in the North-Eastern Transvaal and along the Natal South Coast. The insect attacks both full-grown and young trees.

Guavas

The available cultivars Fan Retief, Malherbe, Du Preez and Van Zyl do not have all the ideal properties for processing, and a selection programme is being undertaken at present to find guava types that are more suitable for canning.

During the past season 500 trees were examined and 4 new provisional selections were made. This brings the total number to 26. About 600 seedlings were grown from seed of promising fruit. The seedlings will be subjected to strict selection as soon as they are in bearing.

NUTS

Pecan Nuts

Although the pecan nut industry in South Africa is relatively small, it has nevertheless enjoyed a great deal of interest and new plantings are being established, particularly since highly productive cultivars were imported from the U.S.A. These trees are being planted and old cultivars that do not produce well are being topworked.

Increased production is therefore expected. Present production is estimated at 150 to 175 tons of unshelled nuts a year. The whole crop is consumed in South Africa.

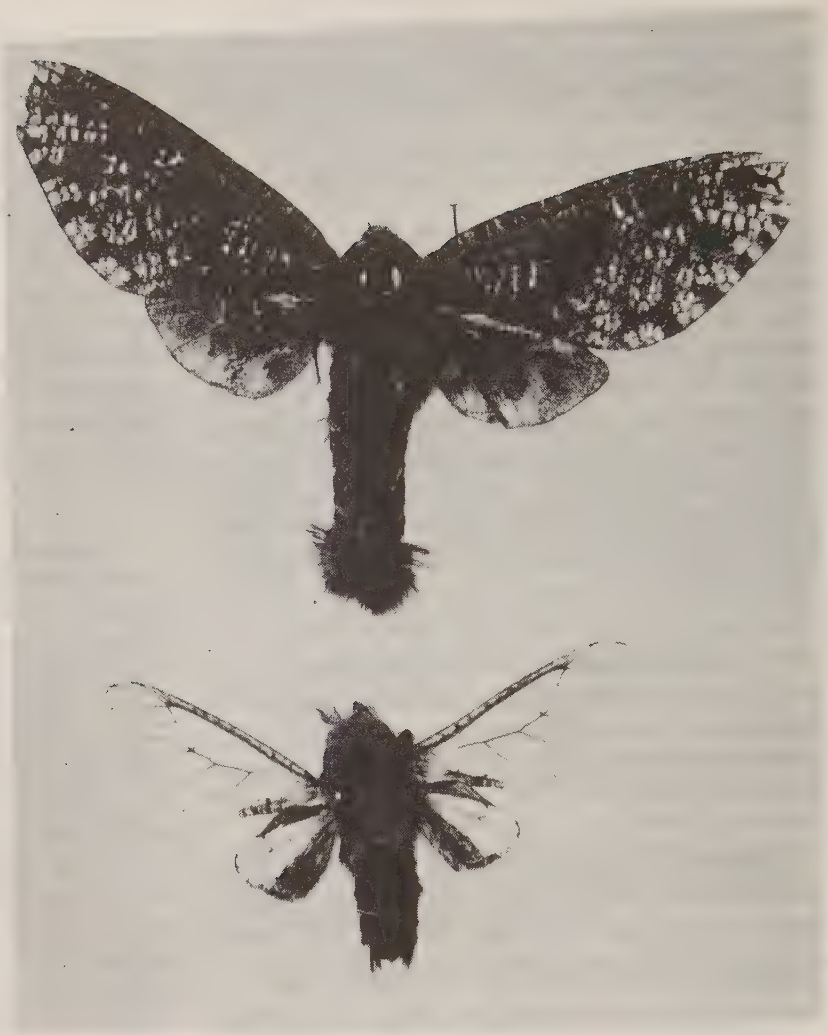
New cultivars are still being imported from overseas and the cultivar Cherokee is still under quarantine. Twelve cultivars are being tested at present for nut production and quality. The ones that are doing best at present and are recommended for commercial planting are Desirable, Choctaw, Barton and Wichita – the last-mentioned cultivar only for areas of low moisture during summer and areas where scab is not a problem.

During the year under review success was achieved with the storage of pecan trees lifted in winter. The trees can be stored at 4°C for a few months and planted in the summer when weather conditions are more favourable. This method of transplanting offers great advantages for both the farmer and the grower who find it difficult to deal with a large quantity of trees during the short winter period.

The growing of pecan nut trees in special, large plastic containers in the nursery was also successful. This eliminates the labour problem to a large extent, since deep trenches need not be dug to lift nursery trees.

Further progress has been made by the Department of Horticultural Science, University of Natal, with the development of techniques for pecan nut clonal rootstock propagation. Experiments on hardwood stem cuttings taken in early July 1972 showed that there are marked differences in both ease of rooting and establishment after the first dormant season between different cultivars.

Thus Desirable and Barton cuttings gave over 90 per cent rooting and over 50 per cent long-term survival, whereas Mataffin which has been extensively used in the past, is now known to perform poorly in both the above respects. Thick cuttings survive much better than thin cuttings.



The pecan stem borer *Eulophonatus myrmelon:* female (at top) and male

Macadamia nuts

The cultivation of macadamia nut trees is arousing a great deal of interest in South Africa at present. The growth and production of these trees and the quality of the nuts have proved that there are good possibilities for commercial macadamia cultivation in this country.

The total production is estimated at about 15 tons at present. This crop is still obtained chiefly from the many seedling trees in the country. A large part of the crop is consumed by the owners or sold for seed purposes.

The macadamia therefore remains a relatively unknown variety on the South African nut market, but once the many grafted trees start coming into bearing, production should rise to a commercial level – sufficient for the local market and even for exporting.

In order to start the macadamia industry on a sound footing, an extensive selection programme is being carried out to select from the many seedling trees that are available, those types that meet both the production and the nut quality requirements. Success has already been achieved, and two South African macadamia cultivars were registered during the year under review, viz Nelmak 1 and Nelmak 2. A further 60 selections were made provisionally and are at present being tested and compared.

In order to establish the correct spacing for macadamia trees, an espacement trial was laid out in a fan shape, i.e. the Nelder lay-out was followed.

According to results obtained in the course of research on the fertilising requirements of macadamia nut trees, it is clear that this tree needs a great deal of nitrogen for optimal production. At seven years a crop of 9,3 kg of unshelled nuts per tree was obtained with an application of 1.8 kg of limestone ammonium nitrate, whereas only 6,6 kg of nuts were produced where 0,9 kg was applied.

Phosphate applications also tended to increase yield, and potassium applications tended to have the opposite effect.

A four-year-old macadamia tree being irrigated by micro sprayers

Up until now there have been no serious disease problems found on this crop in the Republic. It has now been found, however, that several macadamia trees in the Northern Transvaal are showing stem cankers and subsequent poor growth. These trees were adjacent to an avocado grove infected with *Phytophthora* root rot. *Phytophthora cinnamomi,* the causal organism of the disease on avocados, was also isolated from the bark lesions on infected macadamia trees.

This fungus has previously been recorded on macadamia in Hawaii and California.

The reason for the sudden appearance of this problem is probably the very heavy rains experienced during the 1971/72 season.

Macadamia nuts are attacked by at least three Lepidoptera species, viz *Spectrobates ceratoniae,* a small silver moth, *Cryptophlebia leucotreta,* the false codling moth, and some other species of *Cryptophlebia*, possibly *Cryptophlebia peltastica*, the litchi moth. The type of infestations caused by these three moth species and their habits are very similar.

In the Louis Trichardt area growers find the pest very troublesome during the season. Control is more difficult than in citrus, since the infested nuts do not necessarily drop early, as infested citrus fruit does.

Nuts of the two new macadamia cultivars recently released, viz Nelmak 1 and Nelmak 2, have hard shells that are not so easily penetrated by the moth larvae. It is therefore desirable that in future growers plant these species in order to overcome the insect problem.

STRAWBERRIES

During the past season three Transvaal growers took part in the strawberry scheme. Six cultivars, viz Festival, Earlibelle, Parfait, Selection A, Robyn and Tioga were offered for certification by these growers.

There were no rejections after field inspections.

In the Western Cape two growers participated in the scheme and there were no rejections following field inspections there either. Only three cultivars, viz Festival, Parfait and Earlibelle, were offered for certification there.

Since the State-certified propagation material scheme was launched, interest in strawberry production in the summer rainfall area has increased steadily. The nurseries participating in the scheme were unable to meet the demand for planting material for the present planting season.

However, the shortage of planting material should be ascribed largely to unfavourable weather conditions and the problems with nematode infestation experienced at all the nurseries. Stricter control over foundation material is expected to eliminate these problems to a large extent.

The practice of planting strawberries under protective plastic is becoming increasingly popular among the more progressive producers. This cultural practice not only produced higher yields, but also made the production of a winter crop when market prices are very high a practical possibility in areas where low temperatures make it impossible to produce a winter crop in the open.

The Horticultural Research Institute released the strawberry cultivar Selekta this year. The cultivar starts bearing early in winter and produces big, firm, attractive fruit. The plant grows vigorously and yields well.

If strawberries are grown on the Transvaal Highveld, Middleveld and Lowveld, fruit can be supplied all year round. The chief purpose of the breeding programme is therefore the breeding of good quality strawberries with good cultural properties which are adapted in all three regions, or one of them.

A survey of the incidence of *Verticillium* wilt in strawberries in the Transvaal showed that this disease occurs in the vicinity of Boksburg, Brits, the Hartebeespoort Dam, Levubu, Middelburg (Tvl.), Muldersdrift, Nylstroom, the Roodeplaat Dam, Rustenburg and Warm Baths.

The soil types in which the disease occurs varied from sand to clay loam. It occurs on a variety of cultivars, viz Festival, Karmyn, Robyn, Earlibelle and Klaradyn.

The causal fungus *Verticillium dahliae* was also isolated in two naturally infected weed species and in *Hibiscus trionum*.

FLOWERS AND ORNAMENTAL SHRUBS

Production trends

There was an exceptional increase in interest in the production of proteas and related flowers during the past year. An increasing number of people are starting to realise the potential of the European market for proteas and the Horticultural Research Institute received enquiries on protea production from all over South Africa, but particularly from the Winter Rainfall Region.

It is encouraging that the new interest is centred chiefly on cultivated proteas that can be cared for commercially and that commercial growing is replacing the practice of picking proteas from the veld. There are already several producers with protea orchards of considerably over 10 000 plants, and the industry is still expanding.

Exports

A total of 1 100 000 kg of cut flowers was exported this season. This is 405 600 kg more than during the previous export season.

Most of the flowers (689 400 kg) were exported ex Jan Smuts Airport, and 398 400 kg was exported ex Cape Town.

Most of the export flowers were roses, carnations, gladioli and proteas, and the largest quantities went to Germany, Italy, Austria, Holland and England.

The few rejections that did take place were mainly on the grounds of bollworm, carnation-worm and gladiolus rust.

Flower bulb inspections

51 400 000 bulbs were exported this season, chiefly to Holland, America, West Germany and England. In addition 15 300 000 chrysanthemum cuttings were exported, chiefly to Holland and Denmark.

62 500 000 ornamental shrubs, roses, glasshouse plants, palms and hedge plants were available in registered nurseries.

These included

22 700 000 forest trees,
4 400 000 ornamental trees,
2 200 000 roses,
4 000 000 glasshouse plants,
121 700 palms,
2 000 000 hedge plants,
7 500 000 shrubs.

This season 21 600 000 of these plants and cuttings were exported, as against 22 200 000 last season.

2 400 000 unrooted plants were exported during the past season, as against 2 800 000 the previous season.

Carnations

Carnation-worm infested material presented no problems during the past season. This may be ascribed to the good results obtained from spraying with methomyl (Lannate).

Low temperature (1,5°C) as a sterilisation measure was also fully investigated. The three pre-adult stages of the carnation-worm were subjected to low temperature for varying periods. Eggs, larvae and pupae were all dead after 30, 45 and 60 days respectively at that temperature.

Roses

New releases include 6 hybrid tea roses, 10 floribundas, 1 bush rose and 7 newly-imported rootstocks.

During the winter of 1973 orders for the distribution of virus-indexed material included 200 000 rootstocks, at least 300 rose trees and 1 200 scions.

Proteas

The first protea experimental plantings at the new Protea Research Unit on the Tygerhoek Experimental Farm were commenced. These include the planting of mother blocks of 14 "proteas" selected as being the most important from a commercial production standpoint.

To accumulate experimental evidence on flowering time, adaptation, cultivation, flower quality, etc. in the summer rainfall area experimental plantings are being made at Roodeplaat too.

Chrysanthemums

Pot chrysanthemums have become an extremely important flowering pot plant and production in the Republic is increasing. Several cultivars have been tested for their suitability for use as pot plants and for their response to various chemical growth depressants.

Of the chemicals already tested N-dimethylamino-succinamic acid (Alar-85) applied as a spray at concentrations from 0,5 to 1 per cent active ingredient has given the best results under our high light conditions. Strong growing cultivars, such as the spider types, required double pinching as well as treatment with growth depressants to obtain suitable size and balance as pot plants.

Lachenalias

Promising selections are being propagated and will receive further large-scale testing before general release to growers. These promising selections include the development of large red and purple coloured hybrids. This is the first time that Lachenalias with such large flowers and of these particular colours have been produced.

During the past year a cross of *Lachenalia pearsonii* x *L. pendula* was selected from three selections as suitable for the commercial trade. This hybrid was released as a new cultivar by the Department. This new cultivar, named Christine, has long flower stems with medium large yellow flowers.

Poinsettias

The poinsettia continues to increase in importance as a flowering pot plant and is especially popular because of its long lasting qualities.

Some important commercial cultivars imported from America for experimental work have been propagated and mother plants are now well established at the Horticultural Research Institute at Roodeplaat. These are, however, patented cultivars and material cannot be supplied from the Institute.

Gladioli

In January 1973 the Department's attention was drawn to an outbreak of a hitherto unknown rot of the base of the stem in gladiolus in the vicinity of Johannesburg. Several cultivars such as Pink Friendship, White Friendship, Sans Souci, Spic and Span and Valerium are affected by the disease. *Pseudomonas margrieta*, which has long been known to cause scab on gladiolus corms in South Africa, was identified as the pathogen. The identity of the bacterium is, however, being more closely determined.

It is assumed that regular sprinkler irrigation during the growing stage of gladioli contributed to the outbreak of the disease.

Pelargoniums

Various growth depressants have been tested for dwarfing potted plants of several Regal pelargonium cultivars. Of the substances tested Cycocel has given the most promising results.

Hibiscus

Trials have been started on the use of various Hibiscus varieties as flowering pot plants. Potted plants bearing attractive dark green foliage which remained dwarf and flowered almost continuously, have been obtained from rooted cuttings treated with suitable concentrations of the growth depressant Cycocel.

Medicinal plants

Although the income that can be obtained from growing medicinal plants and plants that yield volatile oils compares well with the income from other crops, and although there is a guaranteed market for them, these plants are not grown on a commercial scale in South Africa. During the past year limited plantings of certain medicinal plants were started on a farm near Rustenburg.

There is a good demand for certain narcotics, medicines and aromatic oils of vegetable origin.

Owing to the increasing interest of firms and farmers in some of the most promising non-tropical herbs, the Horticultural Research Institute is paying particular attention to several medicinal plants which are considered of primary importance, viz:

Datura spp., for the production of the narcotic scopolamine;

Digitalis lanata, for the production of the cardiac remedy digoxin;

Vinca rosea, for the production of a number of alkaloids with which certain types of cancer can be controlled;

Silybum marianum, for the production of silymarin, a specific against liver diseases.

Datura spp. – Various *Datura* species were compared for their scopolamine content. It was found that one strain obtained from the National Botanic Gardens at Pretoria had a fairly high scopolamine content. A few plant selections were made. So far *Datura sanguinea* has proved to have the highest scopolamine content. Unfortunately this plant is by no means adapted at Roodeplaat and no further work with it is intended.

Digitalis lanata was found to be very sensitive to soil temperatures over 50°C. As a result, summer planting at Roodeplaat has failed. Seed has been sown at regular intervals since February 1973 in order to determine a suitable sowing time for the Middleveld.

Vinca rosea – Appears to grow well under the climatic conditions of the Middleveld at Roodeplaat. The various strains are multiplied so that sufficient planting material can be made available for chemical analysis.

Silybum marianum – Because the selections made at Roodeplaat yielded a low alkaloid content, it was decided not to continue with this material. The original seed imported from Germany also had a low alkaloid content. It was also found that the plants do not thrive at high summer temperatures. Selection work and espacement and fertilising tests are being continued with winter plantings.

Aromatic oils – Eight strains of *Pelargonium graveolens,* which were selected for their high-quality aromatic oil, are being maintained. Planting material was supplied to firms and farmers.

VEGETABLES

Tomatoes remain the most important type of vegetable in the Republic, with a gross value of R18 000 000 during the past season.

Muskmelon production is becoming increasingly important, chiefly because of export possibilities. Muskmelons such as Safogen are already successfully exported from the Western Cape by air and attempts are being made to export netted muskmelongs by air from the Transvaal.

A lively interest in the production of sweet potatoes developed after the release of virus-free sweet potato material by the Department. Virus-free material was issued for multiplication to a number of producers of sweet potato vines in various regions.

Mechanisation and processing play an important part in the cultivation of green peas and green beans. The spread of green pea production to the Highveld for spring production is now being investigated. There is a shortage of suitable green bean cultivars, particularly for mechanical harvesting, and green bean breeding experiments are being directed at solving this.

Interest in the local production of carrots has increased considerably. The consumption of green asparagus is also beginning to increase.

Mechanisation is becoming increasingly important in onion production. Onions remain the chief export vegetable.

There has been a great deal of interest recently among producers in the growing of vegetables, particularly tomatoes, in plastic tunnels. These tunnels make it possible to fill in gaps in the production period, particularly during and immediately after winter.

However, there are a number of problems which have to be taken into account, including the high cost of the tunnels.

Interest in vegetable growing in the Karoo Region is increasing. The testing of various types of vegetables has been started on a small scale in this area and promising results are being obtained.

A new research programme was started with the aim of developing more effective control measures against bacterial canker of tomatoes. This disease has become one of the most serious threats to tomato cultivation in the Transvaal and Natal. Since there are no sprays known to control the disease, producers are pinning their hopes on breeding. The first step will be to test various tomato breeding strains, or *Lycopersicum* types, for resistance. Strains that show resistance will be used in a breeding programme.

Tomatoes

Among the canning types the breeding strain L1028–1–1–3 did extremely well in cultivar and factory tests. Other promising breeding strains for canning were L1031–3–1 and L1026–2–2. The latter has a concentrated fruit-set and ripening period, and 70 tons of fruit per ha were harvested at a time.

Among the market tomatoes the breeding strains 1371–4 and 137–2–1 were exceptional and the dwarf breeding strain 58–1–3 is still yielding promising results. Breeders are now selecting within these breeding strains for fruit firmness.

Horticulture's promising canning selection L1028–1–1–1–3 was compared with Roma VF in the Lowveld. Although there were no differences in yield, the quality of the selection from Horticulture was considerably better, particularly with regard to fruit firmness.

Breeding strains with the high pigment character are starting to become pure. The colour and firmness of the fruit are very good.

Breeding for resistance against bacterial wilt in market tomatoes is progressing very well. The quality of the second-generation plants of these crosses is very good. The fruit colour and firmness are far better than, for instance, those of the first cultivars released for this purpose in the U.S.A., namely Saturn and Venus.

In addition to the market tomato breeding strains 1371–4, 137–2–1 and 58–1–3, which did very well at Roodeplaat, the following imported market cultivars also showed good results: Creole, Walter, Burnley Metro and VFN Bush. The imported cultivars of the canning tomatoes Napoli and Ventura and the breeding strain L1028–1–1–3 made a very good showing.

The market tomato breeding strains L1103–2–2 and Manapal X Heinz 1370 did very well on the Lowveld, especially as far as yield and quality are concerned. The imported cultivar Creole also did very well, particularly in the co-operative trials at Mooketsi.

The following market tomato cultivars made a good showing in the Winter Rainfall Area: Walter, 6343VF and Terrific VFNB. The dwarf tomato breeding strains 58–1–3 and Pearson X Immune also produced exceptionally good results.

Espacement trials in which dwarf tomatoes were contrasted with standard varieties showed that closer espacement of dwarf tomatoes results in a great increase in the crop. These trials at Elsenburg and Nelspruit showed that the breeding strain 58–1–3 in particular can be used very successfully there and that Pearson X Ummune yields very well at Elsenburg.

Diseases and pests – Bacterial canker *Corynebacterium michiganense* in tomatoes was found all over the Transvaal this year.

During the past season tomato crops in the Winter Rainfall Region and more specifically along the Olifants River Irrigation Scheme were hard hit by a complex of insect pests. The chief pests were the potato moth *Phthorimaea operculella*, the tomato caterpillar *Heliothis armigera* and the tomato rust mite *Aculus lycopersici.* The first two pests caused a crop loss of 40 per cent. Rust mite along was responsible for a drop of up to 33 per cent in the total crop where no control measures were applied.

A series of chemical preparations were tested for effectiveness against these pests. Promising results were obtained with methomyl, monocrotophos, phenthoate, phosphora-midothioate, methidathion, azinphos-methyl, leptophos, and a carbaryl and molasses mixture.

Onions

The responsibility of onion breeding for the Winter Rainfall Region has now been taken over by the Horticultural Research Institute.

The accent in the programme has been on the production of first-generation hybrid onions. The yield potential of these experimental hybrids has been very satisfactory. Yield increases average about 20 to 30 per cent above the best local varieties. The quality of these hybrids has varied, but can generally be described as fair.

Some of these better first-generation hybrids are now being evaluated for possible commercial production. A number of highly useful male sterile and fertile lines are, however, at the moment available and small quantities of seed can be supplied to interested parties.

The cultivars Pyramid and Bon Accord, which were released by the Horticultural Research Institute some years ago, are still doing well in commercial plantings in the Transvaal. The demand for seed still exceeds the supply.

The breeding strain No. 322 again did very well at Roodeplaat and seed is being multiplied for possible release. This onion has a pronouncedly depressed globose, very firm bulb, is straw-coloured and is far more resistant to botrytis rot than the existing early cultivars.

Caledon Globe and Australian Brown are being selected in an attempt to find a better source of foundation seed for the Winter Rainfall Region. Breeders are concentrating on uniformity, keeping quality and bolting.

A number of onion cultivars and breeding strains were tested for suitability for dehydration. Although the cultivars Dehydrators Nos. 3 and 4 produced the best dehydrated product, cultural problems are experienced with them. One of the Horticultural Research Institute's breeding strains, 29B–2–1–2, also gave promising results.

The influence of temperature on the effect of weedicides on onions – The resistance of a particular vegetable crop to a specific weedicide is not the same in all circumstances. Resistance may vary with the environmental conditions, which, in turn, are affected by the physiological reactions of the plants. An important factor is very high soil temperatures during the summer months, and here the Transvaal clearly differs from countries that have a temperate climate.

It has been observed from time to time that the preparation propachlor, which is in general use in Central Europe, becomes phytotoxic on germinating onion seed sown in February. The phytotoxicity of three preparations recommended locally for use on sown onions was investigated from the point of view of the germination of onion seed (*Allium cepa* L., the cultivars Bon Accord, De Wildt, Pyramid, Sphinx and Texas Grano). The preparations were chlorthal and the two amides, propachlor and prinachlor.

Soil temperatures during the day exceeded 50°C. In the treatments with propachlor and prinachlor the seed of all the cultivars, but particularly the cultivar Bon Accord, germinated extremely poorly, but chlorthal had no adverse effect. In a second field trial with soil temperatures that did not exceed 45°C, propachlor showed no adverse effect on the germination and yield of the cultivar De Wildt.

Green beans

Green beans for the fresh market are of low priority in the bean breeding programme in the Transvaal, because excellent cultivars – Wintergreen, Seminole and Witsa (a runner bean) – are available for this purpose. However, there is still a great need for better-adapted green bean cultivars for processing. The characteristics that should be improved in the existing cultivars are pod fibre content and adaptability for mechanical harvesting. Although good breeding material is available, the breeding strains are still at an early stage of development.

In cultivar trials in the Lowveld Wintergreen produced the highest yield of marketable beans, followed by Seminole. Wintergreen matured earlier than Seminole and at 63 days had already produced 62 per cent of the total crop, as against 34 per cent in the case of Seminole.

Cultivar trials were undertaken at Roodeplaat with a view to exporting green beans by air. Wintergreen and Witsa appeared to be the most suitable as regards yield and quality. On overseas markets beans with straight pods about 12 to 14 cm long, i.e. fairly young pods, are preferred.

Three white-seeded cultivars, viz Gallatin 50, Badie and Bonevert, which made a good showing in the Winter Rainfall Region according to previous evaluations, were tested in a trial for their suitability for mechanical harvesting. Of the three Badie produced the highest yield of marketable pods (8 tons per hectare). Because of its high fibre content, Badie is not very suitable for processing and can therefore not be recommended.

Green peas

Seed size is an important quality standard in the processing of green peas. In the past canning factories were unwilling to accept green peas with seeds bigger than 8,75 mm. During the past year, however, the canning factories had the cultivar Mars planted on a large scale in the Transvaal Middleveld for mechanical harvesting and processing, and over 80 per cent of the seeds of this cultivar are bigger than 8,75 mm. This change in the requirements of the canning factories is causing great problems in the breeding programme.

The most promising breeding strain at Roodeplaat was 1068–1B. This strain is now being tested in cultivar trials. A large number of exceptionally promising crosses have reached the stage where selections can be made.

Large numbers of new imported cultivars and breeding strains are still being selected in an attempt to find better cultivars for mechanical harvesting and processing for the Transvaal Middleveld. Of all the cultivars tested at Roodeplaat this year, Minigold is the most promising. Other cultivars such as Mini, XPF 27, Greenfeast No. 9 and Mars were also good, but had defects such as oversized seeds, pods that split easily and a great deal of hay.

Cultivars trials with green peas at Glen indicate that this crop can be grown with success under irrigation in the Free State. The cultivar Cape Freezer produced exceptionally high yields there.

Sweet potatoes

Trials in the Winter Rainfall Region showed that the cultivars Koedoe, Griekwa and Brondal give the best results there. Co-operative trials at Wellington and Wolseley confirmed these results.

It became clear in the course of cultivar trials at Roodeplaat that if virus-free propagation material is used Impala is still the best cultivar for the Transvaal Middleveld.

At Roodeplaat parent plants of Eland, Griekwa, Impala and Mafutha that indexed free of viruses were obtained by means of heat therapy and growing point cultures. Although the cultivars Brondal, Koedoe and Borrie are still being treated, improved material of all three is available. Material of the cultivars Mafutha, Borrie, Griekwa, Eland and Impala has been made available to the trade on a large scale.

According to producers in the Lowveld, the old Impala propagation material produced a crop of about 10 tons per hectare last year, as against a yield of 38 tons from the purified material. In the case of Eland it was 42 tons as against 10 tons with the old material.

Pumpkins

At present Boer pumpkin breeding is aimed chiefly at further inbreeding of the Van Niekerk selection in order to purify it. These pumpkins are large, their appearance is good and they yield well. During the past season the breeding strain 73/9 was the most promising with regard to appearance, uniformity and yield.

Powdery mildew *Sphaerotheca fuligimia* is still a serious problem in cucurbits, particularly in the Lowveld, if control measures are not taken in good time. The systemic fungicides give the best control, provided they are applied in good time. Registered preparations that are effective against this disease are Afugan, Funginex and Imugan.

Baby marrows

Cultivar trials were undertaken with several Courgette cultivars with a view to the export market. It appears that of the cultivars locally available the Zucchini types and A Ambassador are the most acceptable for the export market from the point of view of fruit shape, colour and yield.

Of the imported types F1 Epicurean yielded best and had the most acceptable fruit shape. Unfortunately it is greyish-green in colour and therefore not as attractive as the dark green types.

Bitter cucumbers

A breeding project for developing cucumbers that are well adapted and produce a good yield of fruit of good size and a high bitter principle content is now more or less complete.

The breeding strain 3–19 gave the best results with regard to fruit size and yield during the past season. Its bitter principle content was slightly lower than that of 4–33, however, but the fruit size of the latter was not all it should be. Since their bitter principle content differs so little, the breeding strain 3–19 is regarded as the best. Bitter cucumber breeding work will be completed shortly.

Garlic

Cultivation trials with garlic in the Transvaal Middleveld proved that the best crops of high quality are obtained by planting in February and March. With later plantings both the yield and the size of the bulbs decrease.

Sweet peppers

At present there is a great deal of interest in sweet peppers, owing to the good prices obtained abroad.

Cultivar trials in the Transvaal Middleveld, which included 19 cultivars, show that there are no significant differences in yield or quality between these cultivars. The cultivars Californian Wonder Selected and Keystone Resistant Giant were the best with regard to the colour of the fruit and the thickness of the fruit wall.

Egg fruit

It was apparent in cultivar trials in the Lowveld that certain of Horticulture's breeding strains were doing better than most of the present cultivars. Some of these breeding strains are also far more resistant to bacterial wilt than the cultivars. At Roodeplaat the cultivar Long Purple is still the best, particularly for the export market.

The fungus *Verticillium dahliae* was isolated from egg fruit plants for the first time in the Transvaal this year. This disease occurred in plants that had grown badly and were stunted. In future this disease will be taken into account in the breeding programme.

Muskmelons

Trials showed that Honey Dew, a winter muskmelon that is well adapted in South Africa, gives variable results in the Winter Rainfall Area, chiefly because the seed is not pure. A selection programme was instituted to improve Honey Dew.

The cultivars Ogen, which has a poor keeping quality, and Tendral Negro, which is poorly adapted, are very popular on the overseas markets. These cultivars were crossed with Honey Dew in order to improve the characters mentioned above and so make available better cultivars that are suitable for export from the Winter Rainfall Region.

COFFEE

The current coffee output in the Republic is about 285 metric tons, to the value of about R220 000. However, production is still far below the country's annual consumption, and 17 700 metric tons of coffee, to the value of R6 722 000, was imported during the past year. About 10 per cent of the imported coffee is high-grade Arabica coffee, the rest being Robusta coffee of a far lower grade.

Research is being undertaken at present to determine which cultivars are resistant to coffee rust *Hemileia vastatrix* and which varieties yield best.

The cultivar SL14 shows a high degree of resistance to coffee rust and its yields are also high. Other cultivars that yield well but are not resistant to coffee rust are SL28 and SL34.

The pruning of coffee trees is a standard practice. It was established that pruning to a multiple stem has decided advantages over the practice of pruning to a single stem.

It also became evident that shade trees are needed for coffee growing in the hotter parts of the country.

TEA

At present the Republic produces about 800 tons of tea to the value of R880 000. The tea plantations are still young and increasing production can be expected in years to come. At present tea imports amount to some 22 000 tons.

In the course of the selection programme aimed at finding well-adapted clones, 45 tea bushes were selected from 879 912 seedling bushes. The selected plants are now being further tested for their rooting properties. Ten nursery plants were selected out of 20 000 seedlings and are now undergoing further tests for rooting.

The mechanical harvesting and pruning of bushes with the aid of a pruning machine is a new development in South African tea production. If the method proves successful, it will reduce labour costs drastically and place the production of tea on a more economic footing.

6. The Livestock Industry

BEEF CATTLE

Production trends

The North-West Cape appears to be an ideal area for producing weaner calves, for which there will be a great demand in future as the feed pen industry near the the controlled markets develops. Attempts are being made through extension to guide breeding in this direction.

The unhealthy increase in crop farming in the North-Western Cape is being discouraged, and artificial pastures on dryland are beginning to play a part.

In the Transvaal Highveld there is a strong tendency towards the production of weaner calves for fattening and marketing as young cattle. Winter feeding remains an important problem, however.

In the Eastern Transvaal Lowveld intensification of beef production is gaining more and more ground. Crossbreeding is increasing and the Afrikander generally serves as the basis for crosses with dual purpose breeds. Artificial pastures and controlled selective veld management in particular contribute to increased production.

So far there has been relatively little interest in the Eastern Cape in the intensive finishing of cattle in feeding pens. Cattle are still kept to control veld growth and so create favourable grazing conditions for sheep.

Crossbreeding is a general practice and weaner calves with good meat characteristics are in great demand. The vast majority of beef cattle are still marketed from the veld, however, with the result that the cattle are given poor grades and do not produce a high carcass mass.

Breeding

The application of artificial insemination under extensive conditions is enjoying particular attention at the Armoedsvlakte and Vaalharts Research Stations. Afrikander cows are synchronised with progesterone and pregnant mare serum is applied over a period of eleven days. An eighteen per cent higher incidence of oestrus was obtained, and on heat periods were also far more concentrated.

A preliminary investigation indicates a pregnancy rate of 40 per cent during the synchronised oestrus, whereas an overall pregnancy rate of 60 per cent was obtained within two months under veld conditions with the aid of A.I.

During the same period of two months A.I. was also applied to two groups of Afrikander cows being grazed on veld. There was a 78 per cent pregnancy rate in the group that were weaned early, as against 58 per cent in the group suckling calves. This percentage is most satisfactory and is considerably higher than the percentage obtained at Vaalharts so far.

Although the synchronisation is still very disappointing, the incidence and spread of synchronised on heat periods are still progressing very favourably.

The great variety of breeds and types found in the Highveld Region makes an evaluation of the efficiency of these types for intensive meat production necessary. Simmenthaler and Friesland weaner calves were profitably fed on maize silage *ad lib* plus a high protein concentrate at Potchefstroom, and produced satisfactory carcass grades at 13 months.

Preliminary results of trials at the Vaalharts Research Station show that there are striking differences in potential in certain different breeds or types. The pure Simmenthaler and Sussex heifers reach puberty considerably earlier than pure Afrikanders. Crossbred Afrikander heifers also reach puberty far earlier than pure Afrikanders and they maintain a far higher level of impregnation and reimpregnation.

The effectiveness of good grazing and herd management was patently clear this year from the high pregnancy percentage of an average of 89 out of 415 cows and heifers in the three breeding herds of pure-bred Bonsmaras, Simmenthalers and Afrikanders at the Towoomba Research Station in the Transvaal Region.

Feeding

A milestone was reached when the first open track gas exchange apparatus for farm animals in South Africa was completed and taken into use. This apparatus, which is kept at the Animal and Dairy Science Research Insitute, has now made a South African fodder evaluation system possible for the first time; by means of this system the actual production value of fodder cost items for various types of farm animals and for various forms of production (meat, milk, wool) can be reliably determined.

Experimental work in this field was begun when the actual production value of South African types of hay for meat production was determined.

At Soutpan, where beef cattle have been run on controlled selective grazing for the past seven years, the weaning masses of 205 kg, 182 kg, 205 kg, 186 kg and 205 kg for the last five successive seasons show that a genetic ceiling has probably been reached. During the five seasons high calving percentages of 94, 93, 70, 85 and 85 per cent were maintained except during one year.

At the Roodeplaat Research Station the Bonsmara nucleus stud has been run on controlled, selective grazing for the past two years only. The heaviest weaning masses obtained during the past two years were respectively 308 kg and 288 kg for young bulls and 258 kg and 251 kg for heifers.

The good weaning mass of 228 kg at 210 days was obtained at Bethlehem with calves from a dairy herd kept and managed like a beef herd. Creep feeding showed a mass advantage of 14,5 kg.

Average profits of R45 over feed and purchase costs were obtained with weaner calves fed *ad lib* on maize silage and a protein concentrate for 200 days. In view of the rapid rises in the prices of oilcake and fishmeal, it is important to note that a protein supplement consisting of lucerne meal and urea was successful for weaner calves on maize silage rations.

Observations with beef cows fed *ad lib.* on a simulated veld ration showed that almost twice as much is taken in daily (including the calf's intake) when the calf is 12 weeks old and is being suckled as when cows of the same mass are not suckling a calf. This difference in feed intake owing to the effect of lactation shows how important it is to take the production phase into account when calculating the veld's carrying capacity in terms of large stock units.

The toxicity of boil smut maize was tested by feeding Friesland oxen *ad lib* with severely infected maize plants. After 14 days the oxen showed no symptoms of poisoning.

The results of a trial carried out on the sandy sour grassveld at the Dundee Research Station showed that supplementation consisting of licks containing nitrogen for cattle run on winter veld was not sufficient to maintain reproduction at a desirable level. Supplementation consisting of maize silage and/or *Eragrostis curvula* hay was necessary. The reimpregnation figure for animals on veld plus lick was 25 per cent as against 87 per cent where cows received silage and/or *E. curvula* hay plus a winter lick.

The value of cafeteria feeding for weaner calves was investigated in a pilot trial at the Estcourt Research Station. One group of oxen received a ration of 25 per cent *E. curvula* hay, 68 per cent maize meal and 7 per cent carcass meal *ad lib.* Other groups had free access to the same feeds, in combination or separately, ground or unground. The oxen on the completely composite ration not only grew better, but also showed the most economic growth increase.

Good results were obtained in South West Africa with 19-month-old steers fed on the veld for a period of three months. On good rested veld concentrates were supplemented with 1 per cent of the livemass.

The same method was tried with weaner calves at 8 months, but it was unsuccessful. The calves' intake of concentrates was too low and the feeding period too long for the method to be a success from an economic point of view.

Research in the Free State Region showed that Simmenthaler cows ate about 22 per cent more than Afrikander cows and that the Simmenthaler calves had a 40 per cent greater weaning mass than Afrikander weaner calves.

The past few seasons have been poor ones at the Mara Research Station, and the breed differences in regard to the economic characteristics were far less marked than during the past season, which was a good one.

The difference in the weaning mass of Afrikander calves in poor and good seasons was only 2 per cent, whereas the weaning mass of Simmenthaler and Simmenthaler cross calves improved by 10 per cent in good seasons. This year the weaning mass of calves from the mating of Afrikander bulls with ½ Africander: ½ Simmenthaler cows was 216 kg at 196 days, whereas the calves of similar cross-bred cows mated with Hereford bulls had a weaning mass of 235 kg.

With a covering season of only two months a year, the calving percentage this year varied from 74 per cent in the case of Afrikander cows to 96 per cent for cross-bred cows. This is far better than the percentage obtained on poor veld supplemented with energy and protein.

Concentrate supplementation for five to six months to weaner oxen of various breeds and crosses on sweet bushveld grazing showed that optimum utilisation of feed sources is not promoted by stimulating growth by means of supplementation for the duration of a less favourable season only.

In finishing various breeds and crosses of weaner oxen that had been receiving creep feeding, it was found that the average daily mass increase was lower, the feed conversion poorer and the finishing time required to attain super carcass grade longer than in the case of weaner oxen that had not previously been on creep feeding. Any advantage that creep feeding may have had at the weaning stage was wiped out during the finishing period.

Oxen of the ½ Hereford: ¼ Simmenthaler: ¼ Africander cross performed best in the feeding pen as regards daily mass increase (1,06 kg) and finishing time (90 days). Simmenthaler oxen had to be fed for the longest period (183 days), but attained the greatest body mass (400 kg) on reaching the super grade. The lowest body mass at which the required condition was attained was 315 kg in the case of Hereford oxen.

Research at Dohne shows that the additional cost of supplementation during the winter is advantageously covered by better growth of the young animals and higher calving percentages.

In the course of an overwintering trial with weaner steers on rested sour grassveld at Dohne it was found that an increase in livemass could be obtained by replacing 30 per cent of the nitrogen in a non-protein nitrogen energy lick with fishmeal. Until now it has not been possible to do this with a purely non-protein nitrogen energy lick.

Although fishmeal has gone up in price, its inclusion in a winter lick at the above-mentioned level for weaner calves on sour grassveld is nevertheless justified.

In an overwintering trial with weaned beef breed calves on Dohne sourveld snapped corn-and-cob meal was used with lucerne hay as a supplement. At the end of the winter period the group that had been fed was an average of 78,8 kg heavier than the control group.

During the covering season, at an age of 14 to 18 months, all the heifers that had been fed had reached the required covering mass of 300 kg and been mated, whereas only 2 out of the 11 heifers that had not been fed were able to reach this mass.

This shows that the cost of supplementation during the first winter was justified from an economic point of view.

National Aid Schemes

The membership of the National Beef Cattle Performance Testing Scheme rose by 100 to 750 members during the past year. The S.A. Stud Book Association shows a keen interest in this Scheme, and the assistance of its Department of Technical Services

Bulls which have been entered for the performance testing scheme of the Department. The photograph was taken at the Animal and Dairy Science Research Institute at Irene was obtained with the collection of data for performance testing of smaller stud herds. All the breed societies already accept performances testing in principle.

Last year saw the conclusion of a decade of bull growth tests in South Africa at Irene. During this period 3 167 bulls at Irene and at the testing centres at Queenstown and Omatjenne, which were established later, completed the tests.

The majority of bulls at the centres represented the following breeds:

Irene:

Afrikander	(668)
Hereford	(341)
Simmenthaler	(442)

Queenstown:

Beef Shorthorn	(92)

Omatjenne:

Afrikander	(226)
Simmenthaler	(147)

A testing centre at Armoedsvlakte, Vryburg, with an annual capacity of 200 bulls was taken into use in February 1973. At present there are 56 collaborators (Phases A and B).

The growth testing of bulls on their owners' farms (Phase D) already forms an important part of the scheme. There are already 31 collaborators taking part in Phase D, 10 of whom are in the North-Western Cape. During the past year 400 bulls throughout the country were tested in this way.

DAIRYING

There has been a marked drop in the production of industrial milk in the Natal Region, although fresh milk production is increasing. There has also been a drop in the number of suppliers and a considerable increase in production per supplier. This trend is particularly noticeable in the higher-rainfall areas of the Region, where artificial pastures are the basis of the feeding programme.

Many fresh milk producers have switched from milking by hand to the use of milking parlours.

Producers in Natal are giving more and more attention to balanced rations, possibly for economic reasons.

An annual dairy course was instituted at Dohne in an attempt to promote dairy production in the Eastern Cape. A similar course was offered at Bathurst, and dairy farmers' days were held at several places. Study groups were formed for dairy farmers, and these appear to be of great value.

In the Winter Rainfall Region increasing interest is being shown in beef production from dairy herds as an additional source of income. Friesland bull calves from intensive dairy units are sold to producers who specialise in rearing calves for the meat market.

Milk

Fat determination

Rapid determination of milk fat percentage, which is still the basis of milk purchases at the present time, is of prime importance to the industry. There are distinct signs that the official Gerber method will shortly be superseded by an officially accepted photometric technique incorporated in an instrument which automatically determines the fat content of milk.

The results of experiments at the Animal and Dairy Science Research Institute have indicated that even with 10-day composite samples preserved with potassium bichromate, the accuracy is as good as the Gerber method under factory conditions.

Milk flavoured with natural fruit juice

Success has been achieved with the production of refreshing, palatable beverages which combine the highly desirable protein and mineral constituents of milk with the vitamins and other nutrients of fruit juice. To prevent curdling, small quantities of known stabilisers such as carboxymethyl cellulose (0,2%) are mixed in with 60% milk and 40% fruit juice at 4°C.

Apricot, granadilla, apple or orange flavoured milks have proved most popular. Fortification with vitamins is possible, and the stability of vitamins A and C in the beverage is sufficient. The keeping quality of the product is that of pasteurised milk.

Grading of bulk-cooled milk

The nitrate reductase test (N.R.T.) provides a sufficiently accurate means of detecting refrigerated milk of poor quality and could be used as a basis for the classification of bulk-cooled milk into two categories according to hygienic quality.

Tests for the quality payment of milk

A survey of the quality of industrial milk, tested by means of the methylene blue (MB) test and by standard tests for the enumeration of bacteria, proved the MB-test sufficiently accurate in practice to classify milk into 'standard' and 'premium' quality categories.

Quality payment, based on three tests per month, would be to the advantage of both the industry and the producer of superior quality milk.

Inhibitor in milk

During the period January to June 1973 a survey was made of the incidence of inhibitors, thought to be antibiotics, in pasteurised milk delivered to the homes of consumers in Pretoria. 44 per cent of the 170 samples of consumer milk tested contained inhibitor.

During the period March to June 1973, 2 494 milk samples from producers who deliver milk to Pretoria dairies were tested. 8,3 per cent of the samples tested during the entire period contained inhibitor.

The incidence of inhibitors in milk decreased during the test period as a result of action taken by the Milk Board against the producers concerned.

During the same period 51 of the samples that had shown a positive result in the inhibitor tests were tested. In 39,2 per cent of these cases the inhibitory action could be ascribed to the presence of penicillin.

Of the 65 samples of milk taken from milk tankers, 23 per cent contained inhibitor.

An investigation in the Winter Rainfall Area showed that 23,25 per cent of the milk samples contained inhibitors. If these inhibitors were antibiotics, 13,56 per cent of the samples would have contained antibiotics in such quantities as to be harmful to man. The results were brought to the attention of the bodies concerned.

Butter

Manufacture of salted cultured cream butter

The manufacture of premium butter having a good aroma and spreadability has become important to the butter industry. An investigation into manufacturing techniques of salted, sour cream butter showed the major problem to be its keeping quality. Standards have been laid down to ensure that only products of good keeping quality reach the market.

The diacetyl and acetoin content of butter

Methods of measuring diacetyl and acetoin, which are the chief flavouring constituents of cultured cream butter, were investigated. A diacetyl and acetoin content (expressed as diacetyl) of 20 mg/g and over produced the desired flavour in butter.

The spreadability of South African butter

In order to improve the spreadability of South African butter, the iodine value and extruder value (N.I.R.D. extruder) were determined during a survey of several creameries and the effect of season, cream treatments and manufacturing techniques on spreadability was investigated.

Keeping quality of butter

The catalytic influence of copper on the induction of oxidative defects in butter is known. Tocopherol as a natural anti-oxidant, in the quantities normally present in butter, does not compensate for the deterioration caused by an elevated copper content. Efforts to improve the keeping quality of South African butter must therefore start with active steps to reduce copper contamination.

Chlorinated organic pesticides in dairy products

This investigation was confined to butter during the past year. It was found that butter manufactured in winter in the Transvaal, Free State and Northern Cape contained none of these insecticides.

Butter manufactured in summer is being investigated further.

Cheese

The selection of lactic-acid bacteria for the manufacture of S.A. Gouda cheese

Because the local cheese industry needs suitable starter cultures, certain of the isolates from ordinary commercial starters were subjected to exhaustive examination and classification. Depending on their properties, some of these isolates are now being used in combination, particularly for the manufacture of Gouda cheese in accordance with the requirements of the local market.

Freeze-drying of bacterial cultures on paper discs

In accordance with simplified techniques bacterial cultures are now freeze-dried on paper discs 10 mm in diameter; such cultures can ten easily be handled and distributed in sterile envelopes.

The Dairy Research building of the Animal and Dairy Science Research Institute at Irene

Production of carbon dioxide by starter cultures

The cheese defect commonly known as "blowing" often causes considerable degrading losses. Gas-producing organisms of starter cultures are more often than not the cause of this defect in otherwise well-made cheese. By determining gas production in cultures these cultures are excluded from the starter cycle in cheese starter development programmes at the Institute.

The propionic acid bacteria in S.A. Gouda cheese

The genus *Propionibacterium* has been found to be one of the prominent bacterial species in Gouda cheese and to be the cause of the defect known as "late blowing" during certain times of the year.

Isolates of propionic acid bacteria which are weak gas producers but strong in diacetyl production were found and are now used to develop starter cultures for improved flavour production in both cheese and butter.

The preparation of Camembert cheese

Experiments in the manufacture of Camembert cheese were conducted at the University of Pretoria to determine what the composition of the cheese should be at two days to ensure a ripe cheese of good quality at five or six weeks.

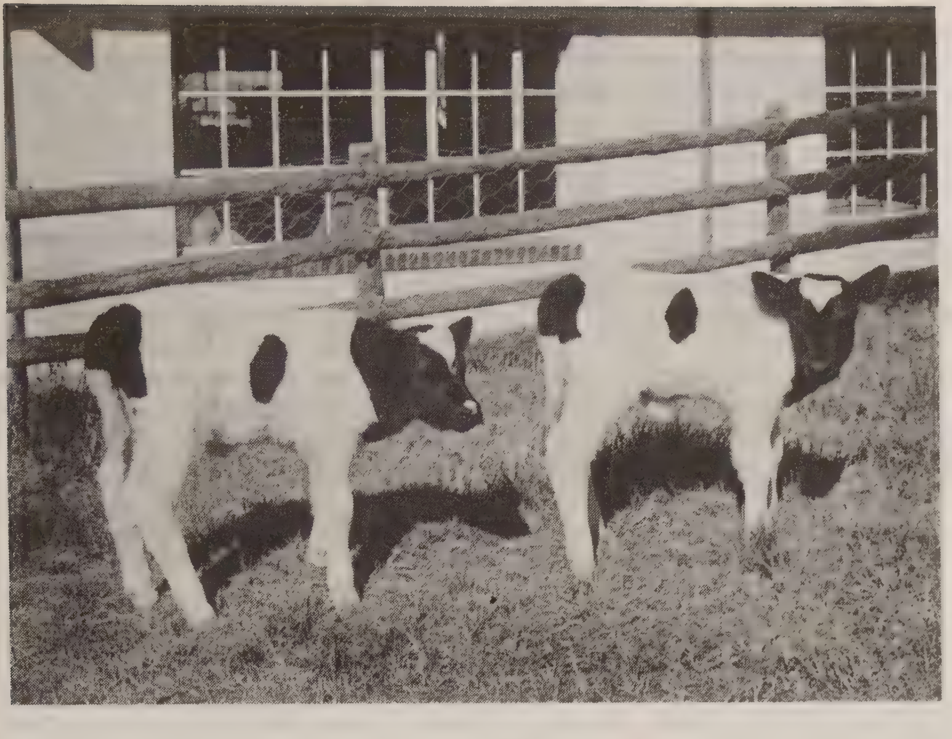
Milk with 3,5 per cent fat produced cheese with 47 per cent to 49 per cent fat in solids, which is well above the statutory minimum of 45 per cent. A moisture content of 50 per cent to 53 per cent, which means 65 per cent to 68 per cent moisture in the fatfree substance, produced ripe cheese of the desired firmness and good quality.

A salt content of at least 4 per cent in the moisture of the cheese can be obtained by leaving the cheeses in a brine containing 20 per cent salt for two hours.

A factory in the Winter Rainfall Region experienced problems in connection with the openness of cheese. Upon investigation it was concluded that phage retarded the growth of the starters and that the gas formation which resulted was responsible for the openness.

By-products

It is possible to concentrate milk constituents by means of a new technique, viz ultrafiltration, without exposing them to drastic treatment. The conversion of concentrated milk of this type into cheese or other dairy products has technological advantages. Soft cheese of fairly good quality and keeping quality has been successfully prepared in this way.



Identical twin Friesland calves at the Dohne Research Station. Twins furnish valuable material for the researcher

It was also possible to manufacture a hard cheese, but the cheese still has undesirable characteristics such as crumbliness; flavour development is still too slow and the cheese still gives off moisture during ripening.

However, the cheese yield is considerably higher than in conventional cheese preparation, because the excellent whey proteins are included in the cheese. In this way both the quantity of proteins in the cheese and their quality are raised.

Extension, training and promotion

A number of cheese factories in the Transvaal, the Northern Cape and the Free State were visited during the year and a survey was made of Cheddar and Gouda cheese pressing methods. The results of the dairy products quality improvement services led to numerous recommendations being made for the improvement of the product at factories.

Several courses were offered by the Dairy School at Glen and attended by a large number of interested persons.

National aid schemes

The milk recording scheme – Although the total number of herds included under the scheme dropped again, viz from 893 to 835, the total number of cows tested remained constant at 33 847, of which 11 283 are registered cows and 22 564 are grade cows.

Seventy per cent of all grade cows are Frieslands. A state-nominated bull subsidy was paid on 86 per cent of all cows tested.

Owner sampling investigation – The results of this investigation, which was continued with 52 herds, show that the method is reliable enough to be put into operation officially. This method eliminates some of the problems that are troublesome at present.

Regular check tests are carried out. Although the number of samples tested increased by 7 000 during the year it was still possible to handle them with ease. Their condition on reception at the central laboratory at Glen has improved a great deal, as the enormous drop in the number of sour, churned and broken samples shows. The chief problem, namely to get a sample to the central laboratory over a great distance in a fit condition to be tested, was solved during the year under review. The period between sampling and the return of the processed data to the owner was 9,6 days.

Blood group investigations

Routine blood group determinations were carried out on 1 800 cattle during the year: 457 were paternity determinations, 413 of which were cleared up. An investigation with Guernseys showed that the registration particulars of 6 out of 127 calves were incorrect.

The blood groups of 200 bulls used for A.I. were determined and placed on record.

The blood group laboratory also participated in the 14th International Comparative Test.

SHEEP AND WOOL

During the 1972/73 season 105,7 million kg of wool was produced in the Republic, as against 111,7 million kg during the 1971/72 season. This represents a drop of 6 million kg during the current season. This drop in production may be ascribed largely to the serious drought conditions. The Stock Reduction Scheme also contributed to the decrease in total production.

Moreover, the high meat prices which have prevailed since December 1972 have to some extent caused a switch to meat production, and this contributed to the decline in wool production.

Breeding

A trial is being carried out to determine whether S.A. Mutton Merino ewes can be successfully mated in March, November and June of the following year if the lambs are weaned at 35 days, and whether the lambing percentage can be increased by means of hormones and flushing.

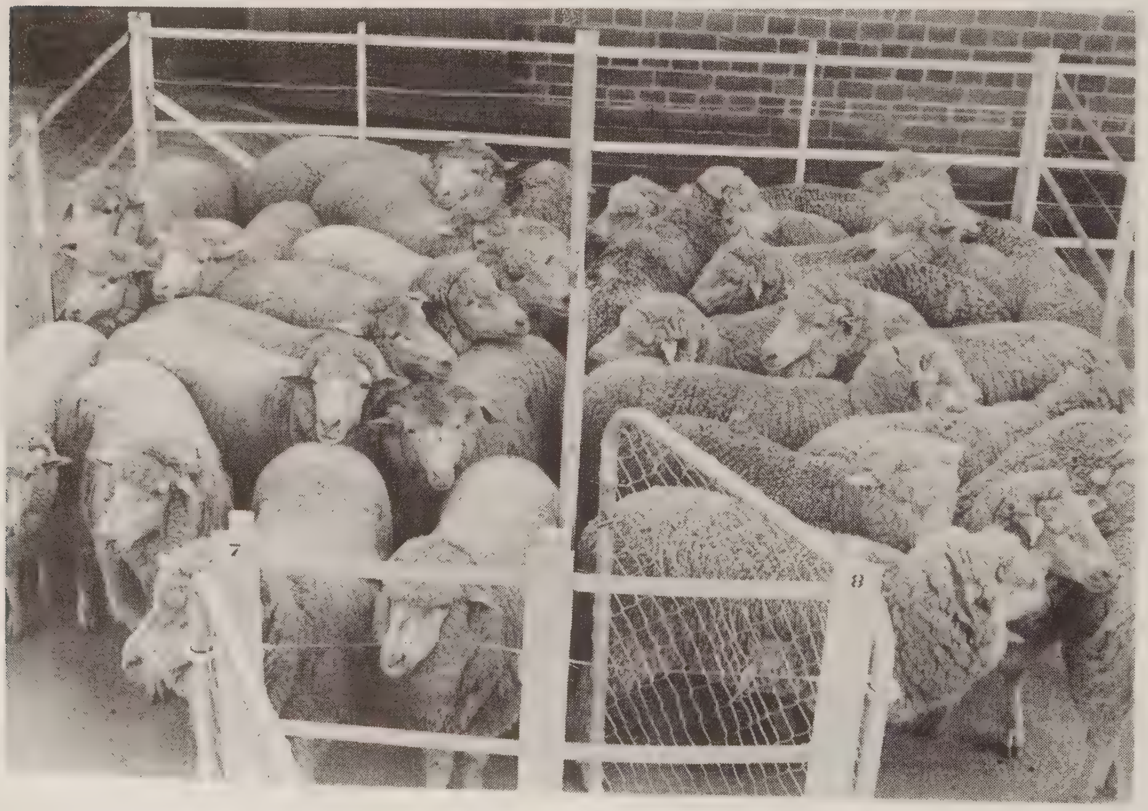
The following table shows the average lambing percentages, fecundity and weaning percentages of the three treatments, viz no I.U.P.M.S. (hormones), 300 I.U.P.M.S. and 600 I.U.P.M.S.:

Hormone treatment	Lambing percentage	Fecundity	Weaning percentage
0	81,4	138,6	102,7
300	73,4	143,4	102,7
600	121,1	177,5	151,4

$$\text{Lambing percentage} = \frac{\text{Number of ewes mated}}{\text{Number of lambs born alive}}$$

$$\text{Fecundity} = \frac{\text{Number of ewes mated}}{\text{Number of lambs born alive or dead}}$$

$$\text{Weaning percentage} = \frac{\text{Number of ewes lambed}}{\text{Number of lambs weaned}}$$



A clear illustration of the effect of blankets (left) on the appearance of wool on Merino sheep. Both groups grazed together on Karoo veld for a period of nine months

Considering that the ewes were inseminated during a season when sexual activity is low, viz November, the results shown in the table are very favourable, particularly as far as the 600 I.U.P.M.S. treatment goes. It appears that there was no difference between the control group and the group that received 300 I.U.P.M.S. during the season of low sexual activity.

The growth of the lambs up to the weaning age of 35 days is shown in the following table:

Type of lamb	Average birth mass (kg)	Average weaning mass (kg)	Mass increase per day (g)
Single lambs	4,82	15,29	306
Twin lambs	4,24	12,39	231

If the average weaning mass of single lambs is taken as 100 per cent, the ewes with twin lambs produced 62 per cent more lamb (i.e. meat) in terms of mass. The average mass increase figures for single and twin lambs indicate that the former show a 25 per cent faster growth rate than the latter.

With a 62 per cent higher production efficiency, the ewes with twin lambs ensured far better production value.

Preliminary results of a selection trial with Merino sheep at the Tygerhoek Experimental Farm show that selection for wool production can be fairly successfully carried out at a very early age (weaning age) by determining the follicle ratio. This may mean that it will be possible to class Merino lambs at weaning age and cull inferior animals at an earlier stage.

Feeding

The nutritional value of sisal pulp for ruminants was established. It appeared that this by-product of the sisal fibre industry has a high digestibility (about 63 per cent) and may be included in ruminant rations provided it is balanced with regard to nitrogen and certain minerals.

Attempts to improve the production value of low-grade veld hay by treating the grass hay with caustic soda were highly successful. The digestibility of grass hay was increased by 30 per cent and the voluntary intake of digestible energy by the sheep rose by over 80 per cent.

Trials with lambs showed that the efficiency of both energy and protein utilisation is significantly increased if the protein: energy ratio is raised from 40:1 to 60:1.

The preliminary results of an investigation into the value of maize silage for lactating mutton ewes indicate that it is an excellent roughage provided it is judiciously supplemented. Protein supplementation is important, however.

In an attempt to correct the uneven growth of spring lambs maize, fishmeal or maize plus fishmeal supplements were given to lactating ewes of four breeds on summer veld at Potchefstroom. These supplements had no effect on the weaning masses of the lambs; nor did they improve the ewes' mass increases in comparison with those of the control groups.

The ewes in the groups that were fed in pens at a fairly high nutritional level showed significantly higher mass increases than the control and supplementation groups on veld, but the weaning masses of the lambs did not differ significantly.

It was found at Bethlehem that if effective use is made of winter cereal grazing, lambs can be weaned at 35 days instead of at 56 days, provided additional concentrates are supplied *ad lib.* The daily mass increase of 0,267 kg of the supplementation group differed significantly from the control group's daily increase of 0,231.

At Bethlehem no significant differences were found between the birth masses and weaning masses of the lambs of ewes that were grazing on veld and received supplementation for the last four weeks before birth and those of ewes that were allowed to graze winter cereals for two hours a day. These findings indicate possibilities for considerable savings in costs in super lamb production.

It was shown in the course of trials at Welgevallen that pre-treatment of proteins with formaldehyde or heat has a favourable effect on both wool growth and physical growth. After treatment vegetable protein sources such as groundnut oilcake compare favourably with fishmeal as a protein supplement.

In an early weaning trial at Langgewens the results of having more than one lambing season a year and weaning lambs at a fixed mass were disappointing. A similar trial at Elsenburg has already shown that Dormers can be successfully weaned at about 8 weeks of age.

Management

At the Roodeplaat Research Station Dorper sheep and improved Boer goats in the ratio 2:1 have been managed on mixed Acacia sour bushveld for the past year, in accordance with a controlled selective grazing system.

It was found that a covering season for lactating sheep and she-goats during the autumn and early winter months is satisfactory.

With optimal management the growth rate of Dorper lambs is good and an average weaning mass of 26 kg is attained at 100 days. However, the growth of kids under similar conditions is disappointing. At 120 days the average weaning mass is 20 kg. These kids were marketable only at 10 months.

National aid schemes

The symposium on performance testing of woolled sheep held in January 1973 at the S.A. Fleece Testing Centre at Grootfontein, which drew 350 interested persons and wool farmers, was one of the main events of the season.

At present wool farmers all over the country are interested in the centre.

Considerable progress has been made with the production of sheep blood group reagents that will be useful in establishing parentage. About 1 000 sheep were used at four different places.

Despite the removal of the headquarters of the officers in charge of the Mutton Sheep Performance Testing Scheme from Grootfontein to Bloemfontein, which necessarily caused disruption, performance testing was applied to 6 000 Dorper lambs.

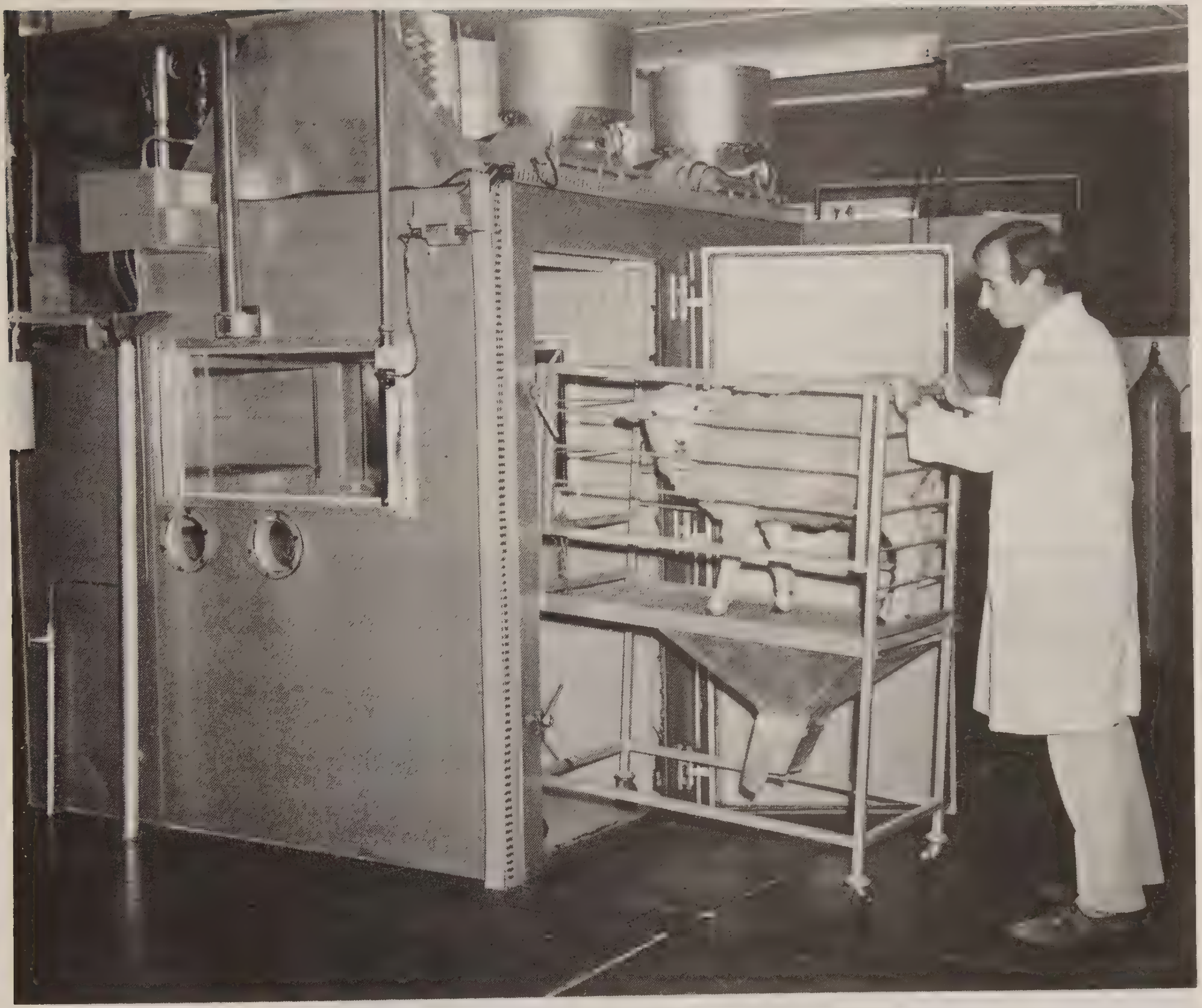
Interest in performance testing for the other mutton sheep breeds is increasing.

Weathering

Research showed that the adverse effect of the season on the degree of weathering, particularly on deeper damage, is kept within bounds if the sheep are not permitted to carry a long fleece during the hot summer months.

It was also shown that weathering can be completely prevented if the sheep are kept covered with a sheep blanket all the time. Weathering can also be controlled to a very great extent by keeping the sheep covered during the hot summer months only.

Breeding season: ewes and lambs of the Dormer stud at Elsenburg



Part of the recently completed animal calorie indicator at the Animal and Dairy Science Research Institute now being used in a programme for developing an efficient feed evaluation system for South Africa

Sheep in individual feeding pens at the Dohne Research Station where feed intake is determined in feeding studies

KARAKULS

Experimental results at the Kalahari Research Station proved conclusively that good quality natural grazing plays an important part in raising the lambing percentage. The possibility of increasing the breeding rate still further by selecting for higher fecundity is being investigated as part of the current research programme.

Breeding

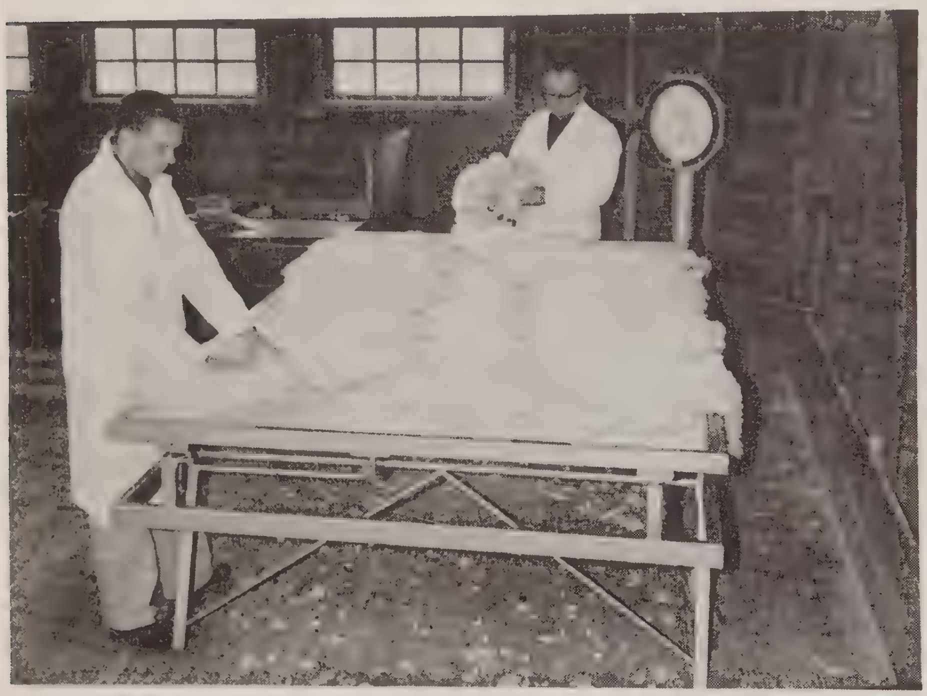
The development of a recessive white colour from black Karakuls with white brushes or blazes is showing encouraging results. A few almost completely white lambs have been born.

Feeding

Varying environmental conditions often have a considerable effect on pelt quality. Where pregnant Karakul ewes were fed at two protein levels it was established that the high protein ration produced a more pronounced curl, longer hair and thicker pelts.

Karakul lambs with docked fat tails ate just as much, grew just as quickly, deposited as much total fat (more in the body) and produced a heavier usable carcass than lambs with tails.

At the Karakul experimental farm at Upington sexual activity was increased by 35 per cent during October and November with the aid of *teasers.*



Mass determination of wool fleece is attracting great attention from farmers interested in performance testing and fleece testing

Snow-white Karakul ewes from the breeding project at the Kalahari Research Station

Experimental work also revealed that the practice of *flush* feeding cannot be automatically included in the management programme for Karakul sheep.

Hormone therapy was also applied successfully to stimulate sexual activity during anoestrus. The same method appears to be successful in increasing the number of lambs per birth.

The development of a better adapted Karakul sheep

The primary purpose of this project is to retain, by means of up-grading, the high fertility of the indigenous breeds, viz the Blackhead Persian and the Namaqua Africander, with which the up-grading process was originally started.

By means of up-grading and selection a type of Karakul has been developed that is more fertile than the pure Karakul and has a pelt of an acceptable quality.

Rennet prepared from the abomasa of Karakul lambs was compared with that prepared from calf abomasa. The cheeses prepared from these two types of rennet showed no significant differences and Karakul rennet does not necessitate any change in the manufacturing process.

Early-weaned Merino lambs on winter grain pasture at the Bethlehem Research Station

Ordinary white (heterozygotes with black heads) Karakul ewes in the breeding test at the Kalahari Research Station

ANGORA GOATS

As a result of the sharp rise in mohair prices since the second half of 1972, there is every indication that Angora goat numbers are again rising.

During the 1971/72 season 4,3 million kg of mohair, to the value of R4,1 million, was produced, and the figure for the 1972/73 season was 3,3 million kg of mohair, to the value of R10,2 million.

The grazing conditions in the mohair production area are generally favourable at present, and a considerable increase in production is expected.

Abortion is still, one of the industry's main problems, but considerable progress has already been made towards solving this problem.

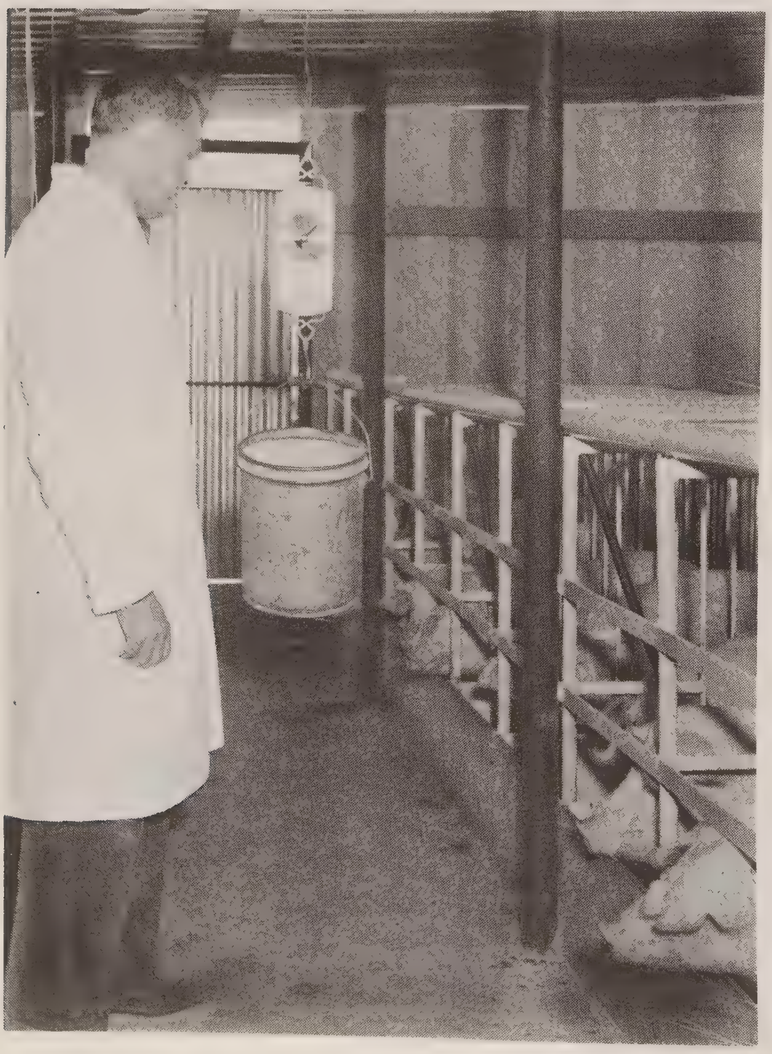
Droughts remain a serious problem. It seems, however, that feed provision in the form of drought-resistant forage crops is becoming more common practice. Of late, many Angora goat farmers have been establishing extensive plantings of drought-resistant forage crops.

PIGS

Management

It has been proved that pale, soft, watery (PSW) pork at abattoirs and bacon factories in South Africa can be the result of treatment prior to killing. Tension as a result of herding leads to a rapid post-mortem drop in the pH of the muscles, a pale colour and a lower water-binding capacity (measured by the cooking loss) – in other words, to typical PSW pork.

An investigation at 764 atattoirs in the country revealed that 72 per cent of all pigs that are stunned with a captive-bolt pistol – a quarter of all pigs slaughtered – show PSW pork.



A modern sow sty for sows in pig at the Animal and Dairy Science Research Institute, Irene. The sows are housed individually and on slat floors. Here the ration for each sow is being weighed

The majority of the pigs slaughtered are stunned electrically (70 per cent), and only 10 per cent of these yield PSW pork.

The captive-bolt pistol, which is in use at 70 per cent of abattoirs, chiefly in the smaller centres, and tension prior to killing are obviously the main causes of PSW pork.

Feeding

The steadily rising feed costs, together with the impending shortage of proteins, is the motive behind the research currently conducted at the Animal and Dairy Science Research Institute on the classification of protein sources on a quality basis and the accurate determinations of the feed requirements of farm animals.

A trial in which pregnant sows were slaughtered shortly before they were due to farrow, and in which their body composition and that of the unborn young were determined, showed that body composition is a valuable aid in establishing an animal's feed requirements for both maintenance and production. Accurate determination of the efficiency with which the animal produces body components such as protein and fat was also possible.

The practice of rearing piglets in latticed pens contributes a great deal to the efficient rearing of early-weaned piglets (weaned at 3 weeks). Owing to the clean conditions, the constant proximity of food and water, and the even climatic conditions in these pens, the piglets grow better and more evenly.

It has been demonstrated that under such conditions the accepted proportion of milk powder in the ration (40 per cent) can be reduced to 10 per cent.

Pig progeny and performance testing scheme

Good progress has been made with the new pig testing centres under construction at Cedara and Elsenburg. Boar performance testing has already been started there. As soon as the new building at Irene is complete, the new performance testing procedure will come into operation at all centres.

Owing to building activities progeny testing showed only a slight increase during the year – 65 groups as against 54 groups last year. Of the 157 boars tested for performance 91 (58 per cent) were disqualified on the grounds of poor performance or foot and leg defects.

The present membership of the pig recording and health control phase of the scheme is 54. The specialised veterinary service started last year has received so much support that the staff is being expanded to three full-time veterinarians, who will implement the scheme together with the staff of the Division of Veterinary Services and the staff of the Veterinary Research Institute.

FOWLS

There has been considerable expansion in the production of eggs and dressed poultry. About 15 million day-old pullets for the production of table eggs and about 70 million broilers were hatched during the year under review. Eggs and poultry can still be supplied to the consumer at very competitive prices, despite the fact that poultry feed costs alone have shown an increase of 25 per cent since January 1973.

For this reason, and because of the predictable scarcity of animal proteins for poultry feeding, nutritional research is aimed chiefly at making better use of available proteins, especially non-animal proteins.

Breeding research workers are also concentrating on blood lines with a better feed conversion.

During the past few years a breeding programme aimed at reducing the age at which young hens start producing has progressed favourably, and research has also proved that a saving in feeding costs can be effected by feeding a low protein ration from the chick stage to the end of the growing stage, without any adverse effects on subsequent production.

With the aid of two quarantine stations built at Irene with Departmental and private funds during the year under review, 16 000 broilers and parents can now be subjected to quarantine measures simultaneously.

Since October 1972 these facilities have been used for 26 000 imported broiler parents from Great Britain and Holland, which may help to raise production as well as bring about more economic production.

National Aid Schemes – The two random sample egg-laying tests are being well supported by breeders and only about 75 per cent of the demand can be met. As a result of a donation from private chicken farmers and the Egg Control Board two laying houses were erected at the Irene farm of the Animal and Dairy Science Research Institute for the holding of a random sample egg-laying test under conditions similar to those on ordinary commercial farms.

Owing to the larger number of breeders entering the industry, random sample tests of broilers are becoming increasingly important.

At the Oudtshoorn Experimental Farm research is being conducted on ostriches. This is the only experimental farm of its nature in the world

TURKEYS

Until fairly recently turkey production was an extensive enterprise and was geared to a seasonal market, but it is now being practised on an intensive scale throughout the year by big concerns.

Two consignments of breeding parents (10 000) have already been imported from Britain for this purpose. Their growth and carcase development are better than those of the local turkeys. These hens also produce considerably more eggs, which help to cut down production costs.

DUCKS AND GEESE

It appears that the potential of the duck as a profitable market bird has at last been realised. In the next decade it could possibly rival the chicken as a table bird.

Geese are also in demand, especially the Chinese breed. It appears, however, that geese are mostly purchased as ornamental birds rather than for the table.

GAME

Although there are only about 15 registered commercial game reserves in the Natal Region (i.e. farms where game farming is the only enterprise and which are fenced with an approved game-proof barrier), there are a number of mixed farms where either the capture and sale of live game or the shooting of game considerably angments the farm income.

The Department is concerned about the possible effect of game on the veld, and this matter is being investigated. Although the investigation is still in a very early stage, it has become apparent that even game cannot utilise Ngongoni veld (*Aristida junciformis*) and also that a special veld management system will have to be developed for game farms.

It seems that burning will have to be applied with great care and circumspection to control vegetation and attract animals from one part to another, and that the commonly applied system of block burning every second or third year does not necessarily give the best results on game farms.

At the Omatjenne Research Station in South West Africa the possibility of game becoming a branch of farming enterprises is being investigated. Although the primary aim is to measure the reaction of the veld and the red meat production per hectare, there are many problems which may be decisive in determining the profitability of such an industry.

The first game harvesting and marketing programme was launched in co-operation with the Division of Nature Conservation. Two harvests yielded 180 and 380 springbuck. The first group was marketed locally, but 318 springbuck from the second group were consigned to a market in Europe. The average mass of the export buck was 19,66 kg and they were sold at 77c per kg. This means R15,15 per buck, or a net income of about R12,00.

At this stage it seems that the sale of game will present few problems, but the most effective harvesting methods for the various types of game and the various areas are yet to be found.

7. Veterinary Services

INTRODUCTION

During the year under review no serious epizootics occurred. Personnel of the Stock Inspection Branch of the Division of Veterinary Services could thus devote more time to routine duties.

Formal in-service training for stock inspectors commenced during the year. The objective of this training is to equip stock inspectors better for their duties.

A new quarantine station at Jan Smuts Airport was taken into use during the year. Modern facilities are available for all domestic animals, birds and rabbits. A quarantine station for poultry was opened at Irene. During the year agreements were entered into with each of the following homeland governments: Venda, Gazankulu, Lebowa, Bophuthatswana, Basotho QwaQwa, kwaZulu and the Ciskei. Thereby independent veterinary services were created for each homeland which will operate under their departments of agriculture.

The agreements make provision for co-operation on all matters relating to disease control etc., and for mutual aid in the event of outbreaks of more dangerous epizootics. Veterinarians and experienced stock inspectors have been allocated to these homelands. They will initiate the services and also undertake training of local personnel.

An officer was appointed at Head Office to the post of Assistant Director (Bantu Veterinary Services) to deal with problems arising out of this new approach and to co-ordinate the services.

The foot-and-mouth disease position in the Republic remained satisfactory. The outbreak among game in the Kruger National Park mentioned in the previous report subsided during the year under review.

Outbreaks of sheep scab occurred in 14 districts in Natal, 7 districts in the Winter Rainfall Region, 5 districts in the Transvaal Region and in one district each in the O.F.S. and Eastern Transvaal Regions.

Considerable progress was again made with the bovine tuberculosis eradication scheme. Compared to the 2 899 herds at the end of the previous year, there are now 3 443 herds participating in the scheme. A total of 237 previously infected herds have qualified for tuberculosis-free certificates since the launching of the scheme.

Outbreaks of corridor disease *(T. lawrencei)* occurred in two districts in Natal and one district in the Eastern Transvaal Region.

The research programme of the Veterinary Research Institute has again been based on a problem survey conducted in collaboration with the Division of Veterinary Services.

Among the infectious diseases of cattle it is evident that those transmitted by ticks, namely redwater, gallsickness and heartwater, constitute the main problems in the cattle industry, while three-day stiffsickness is responsible for economic losses in some areas. Infertility in cattle is very common and it is evident that vibriosis and brucellosis are important problems which, together with calf mortalities as a result of colibacillosis, paratyphoid, pneumonia and navel infections, seriously impede optimal stock production.

Among sheep "geeldikkop", enterotoxaemia, bluetongue, enzootic abortion and infection with pus-forming organisms constitute the main problems. Furthermore, it has been found that internal and external parasites in cattle, sheep and goats are important limiting factors and that poisoning by plants and chemicals sporadically cause serious losses. Pneumonia and diarrhoea in pigs, and Newcastle and other respiratory diseases in poultry, are the most important problems in these species.

It is, however, a disturbing fact that many of the veterinary problems in the country are not due to lack of available knowledge or effective vaccines, but can be attributed to wrong management, improper nutrition and carelessness in the application of preventive vaccination and control of internal and external parasites. Diseases such as botulism (lamsiekte), blackquarter, enterotoxaemia, lumpy skin disease and others still occur frequently in spite of the availability of effective vaccines and other control measures.

A considerable portion of the research activities of the Institute are directed towards the development and improvement of vaccines against infectious diseases of animals and poultry and the investigation of production technology and standards of efficacy. During the year, in this connection, a vaccine against enzootic abortion in sheep was developed in record time and sufficient quantities produced to issue to farmers. Promising results were also obtained with the vaccine in cattle.

During the year the new improved oil adjuvant vaccine against enterotoxaemia was released and the final trials with improved oil emulsion vaccines against botulism, tetanus, vibriosis and the combined vaccine against blackquarter and other organisms causing malignant oedema and gas gangrene were completed and these vaccines will be released shortly.

Good progress was also made with the improvement of the vaccines against horsesickness, bluetongue and Rift Valley fever and the development of a vaccine against elephant skin disease.

During the year a record number of nearly 140 million doses of vaccines prepared by the Institute was issued. The number of vaccines prepared increased from 32 to 35, with the vaccines against enzootic abortion in sheep, infectious laryngo-tracheitis in poultry and an additional vaccine against colibacillosis in pigs becoming available.

The issuing of vaccines to African states increased from 6,5 million to more than 8 million doses of 21 different vaccines. The issues to Zambia almost doubled to more than 3 million doses.

Research on other veterinary problems such as internal and external parasites, plant poisoning and reproductive disturbances progressed satisfactorily. Success was achieved with the cause of "maldronksiekte" in cattle being finally associated with the ingestion of a poisonous plant *Solanum kwebense,* a kind of "poison apple". Furthermore, the toxicity of the fungus *Fusarium moniliforme* to horses was confirmed. Apart from typical nervous symptoms liver damage was also produced.

Very valuable and interesting findings were obtained with the survey on the presence of swine fever virus in soft ticks (tampans). To date infected ticks were found on 27 out of 73 farms in the Northern Transvaal.

On 1 July 1972 there were 149 research projects registered at the Institute. A further 69 projects were commenced during the year and 66 completed. Sixty-two scientific articles were published during the year. Owing to the separation of the Faculty of Veterinary Science from the Institute, a number of research projects had to be closed.

NOTIFIABLE DISEASES

Foot-and-mouth disease

No outbreaks of foot-and-mouth disease occurred. In the previous report reference was made to infection in the Kruger National Park and a private game reserve adjoining the Park, but this infection disappeared during the latter half of 1972.

As a precautionary measure 304 480 cattle, 18 514 sheep and 118 573 goats were immunised in the areas contiguous to the Kruger National Park. An inactivated, trivalent SAT vaccine was used. In the Eastern Caprivi Strip a total of 32 922 cattle and 1 367 goats were vaccinated with the same type of vaccine.

An outbreak of foot-and-mouth disease was reported to the north of the Limpopo River in Rhodesia. Precautionary measures were taken in the Messina and Sibasa districts. This included strengthening of the routine border patrols and immunisation of all cattle, sheep and goats with foot-and-mouth disease vaccine.

Routine measures to protect stock farming areas from foot-and-mouth disease included short interval stock inspections in the areas adjoining international borders and the Kruger National Park, as well as regular patrol and repair of fencing on international and Kruger National Park borders. In the Kruger National Park itself all carcases of animals culled were inspected before transportation and again at the Skukuza abattoir.

In the course of border control 140 cattle, 37 sheep and 100 goats found straying or illegally introduced from adjacent territories were impounded. Of these, 2 cattle and 54 goats were returned to Botswana, while the remaining animals were destroyed.

Rabies

During the year a total of 1 262 specimens were submitted to the Rabies Section, Onderstepoort. Of these 402 (31,8 per cent) – this figure includes 88 from S.W.A. – proved to be positive, with the species distribution as follows:

Meercats	222
Cattle	65
Dogs	25
Domestic cats	12
Jackals	12
Wildcats	11
Sheep	7
Goats	5
Horses	1
Humans	1
Other animals	41

For the first time since 1970 an outbreak occurred in Natal in the district of Ingwavuma. It is, however, believed that the dog strayed from across the border.

Annual immunisation of all dogs was carried out in the declared rabies areas in Natal and the Transvaal. In addition it has been the practice to vaccinate all dogs and cats within a radius of 15 to 25 km of confirmed outbreaks.

A total of 384 199 dogs and 9 701 cats were thus immunised.

The destruction of meercats in heavily infected areas, by means of mobile units, in the Highveld and O.F.S. Regions continued during the year. Eradication was undertaken on 346 farms (122 464 ha) and 25 900 colonies and 7 241 single holes gassed.

Anthrax

During the year 3 cattle died in 3 outbreaks in the Republic. A total of 4 774 511 cattle, 231 543 small stock and 13 781 horses were vaccinated by or under supervision of officers of the Veterinary Division.

In the Kruger National Park 10 confirmed cases were found and the carcases burnt. Eighty three roan antelope were immunised by means of darts loaded with vaccine, at a cost of R29,10 per animal.

East Coast fever and related diseases

East Coast fever was eradicated in 1954.

In the declared areas continued vigilance was maintained and spleen smears were required from all cattle that died. A total of 335 429 smears were examined during the year.

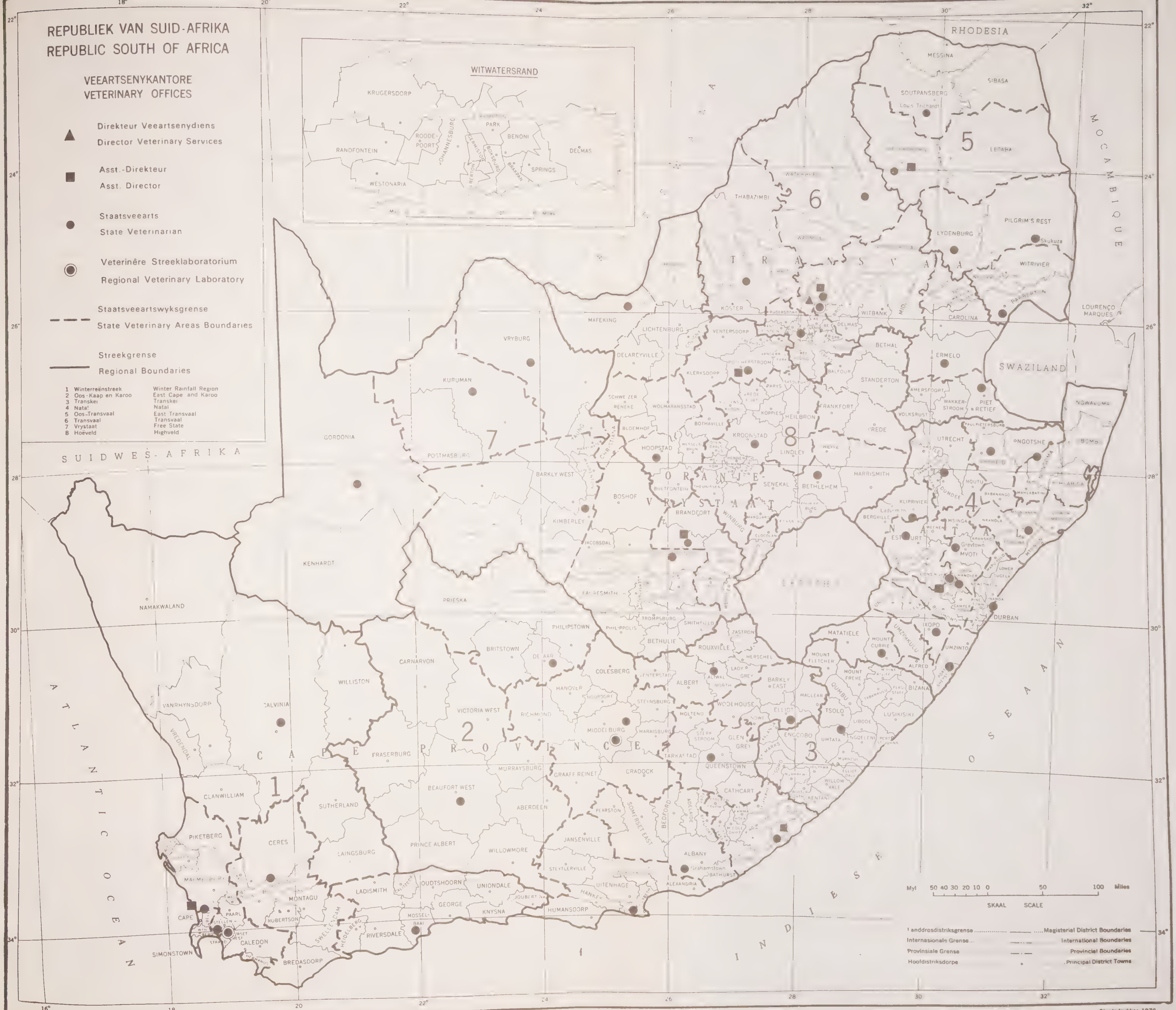
A total of 14 outbreaks of corridor disease (*Theileria lawrencei*) occurred in the Hlabisa and Ubombo districts in the Natal Region. The outbreaks followed the encroachment of buffalo on farms adjacent to the Hluhluwe Game Reserve. Retrictions on stock movements and more intensive dipping controlled the outbreaks. Affected animals were treated with massive doses of tetracyclines and about 55 per cent recovered. The Natal Parks Board started to improve the fence on the boundaries of the Game Reserve. Another outbreak occurred in the Pilgrims' Rest district in the Eastern Transvaal Region, on a farm bordering the Timbavati Private Game Reserve. Buffalo from the Kruger National Park frequently stray on to this and other farms in this district. The same control measures as in Natal were applied to control the outbreak.

Benign bovine theileriasis (*T. mutans*) was diagnosed in 58 cases. These outbreaks were controlled by short periods of quarantine and intensified tick control measures.

Tuberculosis

A total of 2 004 certificates were issued to tuberculosis-free herds during the year under review and at the end of the period 3 443 herds were participating in the eradication scheme, compared to 2 899 the

An advanced chronic case of elephant skin disease


REPUBLIEK VAN SUID-AFRIKA
REPUBLIC SOUTH OF AFRICA
VEEARTSENYKANTORE
VETERINARY OFFICES
▲ Direkteur Veeartsenydiens
Director Veterinary Services
■ Asst.-Direkteur
Asst. Director
● Staatsveearts
State Veterinarian
◉ Veterinêre Streeklaboratorium
Regional Veterinary Laboratory
Staatsveeartswyksgrense
State Veterinary Areas Boundaries
Streekgrense
Regional Boundaries
1 Winterreënstreek — Winter Rainfall Region
2 Oos-Kaap en Karoo — East Cape and Karoo
3 Transkei — Transkei
4 Natal — Natal
5 Oos-Transvaal — East Transvaal
6 Transvaal — Transvaal
7 Vrystaat — Free State
8 Hoëveld — Highveld
WITWATERSRAND
KRUGERSDORP
RANDFONTEIN
ROODEPOORT
JOHANNESBURG
GERMISTON
BOKSBURG
BENONI
SPRINGS
BRAKPAN
DELMAS
WESTONARIA
RHODESIA
MOCAMBIQUE
SWAZILAND
SUIDWES-AFRIKA
ATLANTIC OCEAN
INDIESE OSEAAN
TRANSVAAL
ORANJE VRYSTAAT
NATAL
CAPE PROVINCE
MESSINA
SIBASA
SOUTPANSBERG
Louis Trichardt
LETABA
THABAZIMBI
LYDENBURG
PILGRIM'S REST
Skukuza
WITRIVIER
BARBERTON
LOURENÇO MARQUES
CAROLINA
WITBANK
KOSTER
MAFEKING
LICHTENBURG
VENTERSDORP
DELAREYVILLE
VRYBURG
KURUMAN
POSTMASBURG
GORDONIA
KLERKSDORP
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PARYS
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STANDERTON
AMERSFOORT
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LINDLEY
HARRISMITH
BETHLEHEM
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UTRECHT
NGOTSHE
NGWAVUMA
BARKLY WEST
BOSHOF
KIMBERLEY
JACOBSDAL
BRANDFORT
WINBURG
KLIPRIVIER
Ladysmith
BERGVILLE
ESTCOURT
MSINGA
Greytown
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MATATIELE
MOUNT CURRIE
ALFRED
BIZANA
KENHARDT
PRIESKA
FAURESMITH
LESOTHO
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PHILIPSTOWN
PHILIPPOLIS
TROMPSBURG
SMITHFIELD
ZASTRON
BETHULIE
ROUXVILLE
BRITSTOWN
DE AAR
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HANOVER
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ALIWAL NORTH
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WILLISTON
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STEYNSBURG
MOLTENO
WODEHOUSE
ELLIOT
MOUNT FLETCHER
MOUNT FRERE
QUMBU
TSOLO
LUSIKISIKI
ENGCOBO
UMTATA
VANRHYNSDORP
CALVINIA
FRASERBURG
MURRAYSBURG
GRAAFF REINET
CRADOCK
TARKASTAD
QUEENSTOWN
STERKSTROOM
GLEN GREY
CATHCART
CLANWILLIAM
SUTHERLAND
BEAUFORT WEST
ABERDEEN
PEARSTON
SOMERSET EAST
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ADELAIDE
PIKETBERG
CERES
LAINGSBURG
PRINCE ALBERT
WILLOWMORE
JANSENVILLE
ALBANY
Grahamstown
BATHURST
ALEXANDRIA
STEYTLERVILLE
UITENHAGE
HANKEY
HUMANSDORP
MALMESBURY
MONTAGU
LADISMITH
OUDTSHOORN
UNIONDALE
GEORGE
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RIVERSDALE
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SKAAL SCALE
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Internasionale Grense — International Boundaries
Provinsiale Grense — Provincial Boundaries
Hoofdistriksdorpe — Principal District Towns
16° 18 20 22° 24 26 28 30 32°
22° 24° 26° 28° 30° 32° 34°

Driehoeksmetingkantoor, 1968. Hersien 1969
Trigonometrical Survey Office, 1968. Revised 1969
T.S.O. Misc. 4488

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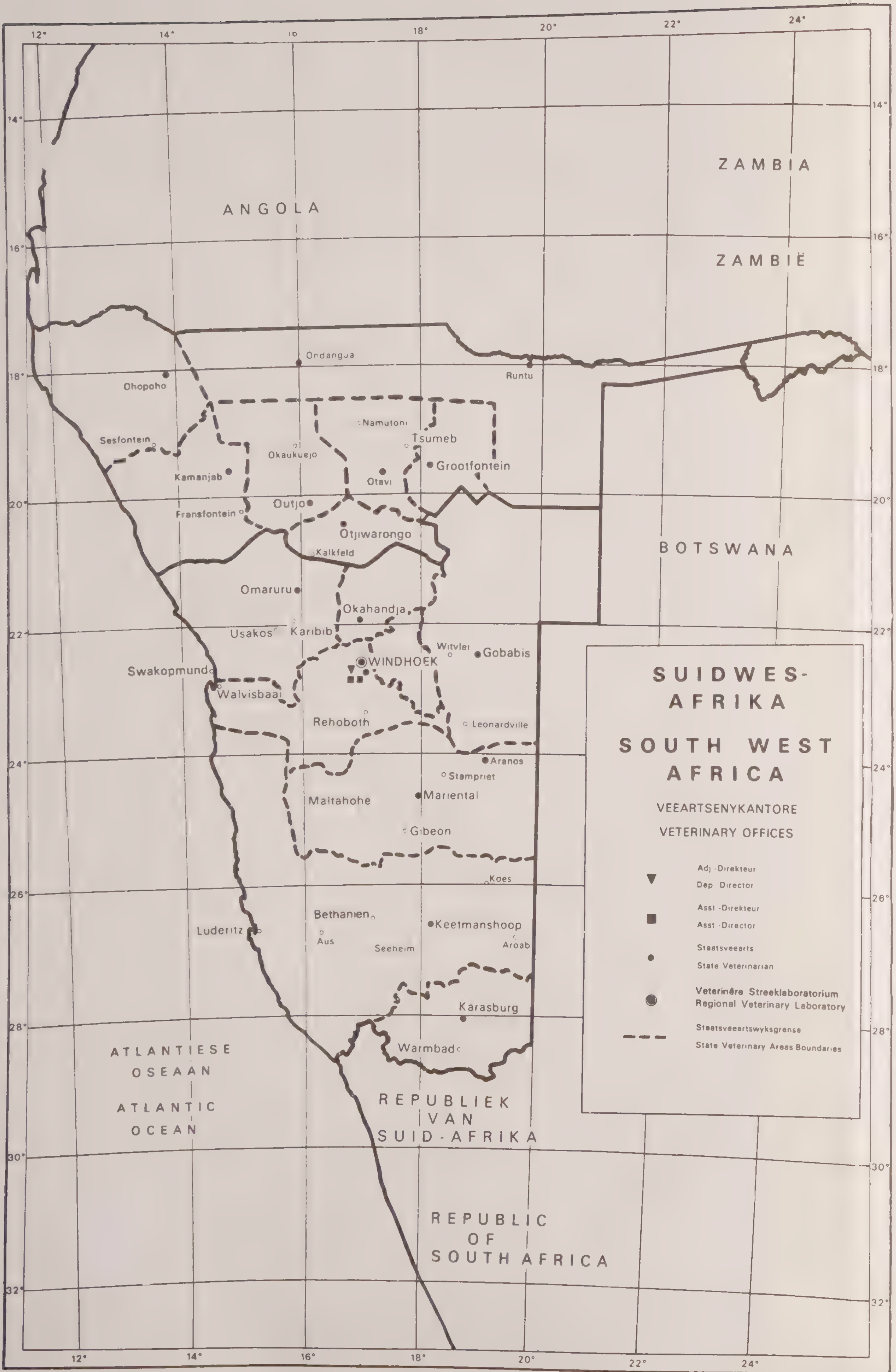
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Regional Veterinary Laboratory
- - - Staatsveeartswyksgrense
State Veterinary Areas Boundaries
ANGOLA
ZAMBIA
ZAMBIË
BOTSWANA
ATLANTIESE OSEAAN
ATLANTIC OCEAN
REPUBLIEK VAN SUID-AFRIKA
REPUBLIC OF SOUTH AFRICA
Ondangua
Runtu
Ohopoho
Sesfontein
Namutoni
Tsumeb
Okaukuejo
Grootfontein
Kamanjab
Otavi
Outjo
Fransfontein
Otjiwarongo
Kalkfeld
Omaruru
Okahandja
Usakos
Karibib
Witvlei
Gobabis
Swakopmund
WINDHOEK
Walvisbaai
Rehoboth
Leonardville
Aranos
Stampriet
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previous year. During the financial year ended 31 March 1973, 512 herd tests were done on 476 infected herds. In these herds 94 948 animals were tested and 2 794 (2,94 per cent) found positive. Of the 476 infected herds, 34 heavily infected herds were treated with Isoniazid (I.N.H.).

A total of 3 077 positive reactors were slaughtered and compensation paid by the State amounted to R381 514. The sale of carcases not condemned at abattoirs realised the sum of R222 752, which means that 58,4 per cent of the sum paid for compensation was recovered.

Testing and transport fees paid to private veterinarians in respect of tests carried out on behalf of the State came to R173 425. A further R18 000 for I.N.H. and ear tags brought the total expenditure on the scheme during the financial year to R572 938.

At the end of the year under review 253 private veterinarians had contracted to undertake testing on behalf of the State.

Since the launching of the scheme on 14 May 1969, 237 previously infected herds have qualified for tuberculosis-free certificates.

A summary of the tests carried out during the year under review is given below:

Excluding tests under the accreditation scheme, the incidence of reactors was 0,83 per cent positive and 0,36 per cent suspected. Infection found in pigs at abattoirs could be traced in some instances to infected dairy herds.

No outbreaks of avian tuberculosis were reported.

At the Research Institute, in a survey of dust (house and office dust) and soil (garden and veld soil) from all parts of the Republic for the presence of mycobacteria, 15 out of 37 soil samples and 26 out of 49 dust samples were positive. On identification the majority of strains were saprophytic.

There is evidence that the facultative pathogen *Mycobacterium intracellulare* is more ubiquitous than previously suspected and that the properties of environmental strains are indistinguishable from mammalian isolates. They cause tuberculin hypersensitivity in cattle and macroscopic lesions in pigs. Domestic animals cannot be regarded as the primary source of *M. cellulare.* Soil may be the reservoir and dust the transmitting vehicle, while plants appear to provide suitable conditions for multiplication and are probably the primary source. The quantities of organisms inhaled or ingested may depend on a number of environmental factors.

Test	Number of herds	Number of tests	Reactors	
			Positive	Suspected
I.N.H.	26	6 138	721	121
Import and export	334	5 971	6	2
Diagnostic	571	39 788	221	126
Interim	1 542	266 690	1 699	911
Accreditation	1 830	269 372	613	369
Total	4 303	587 959	3 260	1 529

Brucellosis

In the brucellosis eradication scheme a total of 628 790 heifers were vaccinated by or under supervision of officers of the Division, and this constitutes a large percentage of the annual national heifer calf crop.

At the Research Institute, Regional Veterinary Laboratories and State Veterinary Offices the following serological tests for brucellosis were carried out:

Species	Number of tests	Result	
		Positive	Suspected
Cattle	79 991	7 737 (9,7%)	1 800
Sheep	4 929	1 033 (20,9%)	–
Goats	41	4 (9,7%)	–

Complement fixation tests were performed on 3 784 sera of rams from South-West Africa and the

Republic at the Research Institute. Of these 696 rams showed positive *Brucella ovis* and 212 positive *B. abortus* titres. This high incidence may be misleading, since recent work indicates that it is extremely difficult to distinguish *B. ovis* positive cases from vaccine reactions. False positives are encountered particularly when adult rams are inoculated.

Unfortunately it is common practice among farmers to inoculate rams annually.

Investigations on the efficacy of Rev I vaccine in rams were completed during the year. From these it is clear that when the vaccine is administered to young rams as prescribed, a very good immunity against *Brucella ovis* is acquired.

Repeated inoculations of adult rams serve no useful purpose, since the immunity is not enhanced. This procedure furthermore confuses the serological investigation of *B. ovis*, because such rams cannot be distinguished from infected animals.

Trypanosomiasis

Nagana

No cases of nagana were diagnosed in the Republic. Several cases, however, occurred in the Eastern Caprivi along the banks of the Kwando River. The annual spraying operations were continued in Mozambique as well as in the Caprivi tsetse fly complex.

On account of the favourable results obtained during previous campaigns, spraying operations were limited to Mozambique for the second year in succession. The area concentrated on lies 64 km east of the Rhodesia-Mozambique border and south of the Rio Save.

From July to 15 September 1972, spraying teams covered an area of 1 049 km^2, where a total of 3 237 km of parallel lines, pans, riverines and contacts were sprayed using 318 805 litres of a 5 per cent DDT wettable powder. The contribution made by the Republic included one senior technician, two officers to supervise spraying units, five three-ton lorries with drivers, two four-wheel-drive vehicles, spares for spray pumps, films for aerial photographs, and the fuel needed for the opening of 200 km of access roads.

South Africa's financial contribution towards the campaign amounted to R17 191.

The results were once again encouraging. Rhodesia, south of the Sabi River, had been free of tsetse fly and the 1972 campaign was primarily aimed at consolidating the position in Mozambique as well as the prevention of tsetse flies spreading to the west. This goal was achieved.

In addition, a further area to the east has been freed from the fly.

All future activities will be concentrated in eastern Mozambique to prevent tsetse flies from spreading southwards. This is a partical adjustment of the initial planning of the second phase of the project by the Inter-territorial Committee for the Control of Tsetse and Trypanosomiasis in South-East Africa.

The Caprivi tsetse fly complex

In accordance with the agreement arrived at during the meeting held at Pretoria on 22 March 1972 by representatives of the Republic, Angola and Botswana, three spraying teams each were again made available by both the Republic and Angola. Owing to other commitments in certain priority areas to the south of the Okavango area, Botswana could not co-operate in the Kwando complex.

In the Eastern Caprivi mopping up was done mainly along the Kwando River. In the Western Caprivi spraying was extended northwards, as far as 20 km into Angola, along the Kwando River. No spraying was done southwards towards Botswana. A total of 4 750 litres Dieldrex 15 T concentrate was used in the Eastern Caprivi and 4 375 litres in the Western Caprivi and Angola.

Surveys revealed no tsetse flies in the Bwabwata area and no spraying was done there. The Angolan spraying teams also withdrew from this area and concentrated north-westwards along the Luiana and Lingueri Rivers to prevent further spread to the Okavango drainage area. For security reasons access to some areas was prevented.

The total cost of this campaign amounted to R21 404.

Routine surveys in Zululand indicated that the *status quo* regarding *Glossina brevipalpis* and *G. austeni* was being maintained and no cases of Nagana were diagnosed.

Dourine

During the year 1 651 serum specimens were examined at Onderstepoort, of which 311 came from outside the Republic. The distribution of the 57 (4,26 per cent) positive South African cases was as follows: Boshof (26), Vryburg (7), Thabazimbi (5), Mafeking (3), Postmasburg (3), Pretoria (3), Lions River (2), Barkly West (1), Eastcourt (1), Hillcrest (1), Johannesburg (1), Nottingham Road (1), Pietermaritzburg (1), Pietersburg (1) and Potchefstroom (1).

The positive reactors within the Republic were all either castrated or destroyed.

Details of specimens from outside the Republic are listed below:

Country of origin	Number of specimens	Number positive
South West Africa	186	4
Rhodesia	120	1
Botswana	3	0
Swaziland	2	0

Lumpy skin disease

Only sporadic outbreaks of lumpy skin disease with low morbidity and a very mild course, except in the case of one outbreak of the Neethling type at Rustenburg, were recorded.

A total of 15 499 cattle were immunised by or under supervision of officers of this Division.

Sheep scab

Sheep scab was recorded in 5 of the 7 Veterinary Regions of the Republic, with outbreaks diagnosed on 49 farms and 4 Bantu areas in the following 24 magisterial districts:

Pietersburg (5), Gordonia (2), Bellville (1), Paarl (4), Piketberg (1), Clanwilliam (8), Swellendam (4), Worcester (1), Laingsburg (1), Brakpan (2), Springs (1), Nigel (1), Johannesburg (1), Heidelberg (1), Bronkhorstspruit (1), Witbank (1), Utrecht (3), Newcastle (3), Dundee (3), Babanango (5), Nqutu (Bantu area), Nkandla (Bantu area), Msinga (Bantu area) and Mtonjaneni (Bantu area).

A total of 260 071 head of small stock on infected and contact farms were dipped under official supervision at least twice at 8 to 10 day intervals.

Mange

Sporadic cases of mange in cattle, goats and pigs were recorded. All cases readily responded to appropriate treatment. Statistics are as follows:

Species	Outbreaks	Animals on farm
Cattle	18	17 089
Goats	126	68 029
Pigs	31	939

In the Kruger National Park mange was observed in impala, cheetah, lion and gnu. Mortality was experienced in cheetah after being dipped in Malathion emulsion, although Malathion wettable powder had previously been used without any untoward effects in this species.

Gnu in a private game reserve were heavily infected and mortality was high.

Swine fever

Classical swine fever does not occur in the Republic and no cases of African swine fever were recorded during the year. In the swine fever control area the same control measures as reported previously were applied during the year.

In studying the epizootiology of ASF, a survey to establish the distribution of the virus by isolation from soft ticks (*Ornithodoros moubata*) is being conducted by the Division and the Research Institute. To date 10 000 ticks have been collected from 149 antbear burrows inhabited by wild pigs on 73 farms. Of these 27 per cent of the burrows and 37 per cent of the farms have been found to be infected. These are situated in the northern parts of Rustenburg, Waterberg, Thabazimbi and Potgietersrus districts.

In an attempt to find a rapid method for the diagnosis of ASF at the Research Institute at Onderstepoort, electron microscopy was compared with the concentration of virus in tissues of experimentally infected pigs. It appears that there is no direct correlation between the two techniques. With electron microscopy virus can consistently be demonstrated only in the plasma of infected pigs, while in other tissues the results are not consistent even in the presence of high virus concentrations.

Swine erysipelas

During the year 4 outbreaks of erysipelas were recorded. In all cases infection yielded readily to antibiotic treatment and improvement of hygiene on the farm.

Epizootic lymphangitis

No cases of this disease occurred during the year.

Johne's disease

Two cases were recorded during the year. Compensation paid for the destruction of these animals amounted to R174. The farms involved, as well as those on which the disease occurred in previous years, were closely watched for further developments.

Infectious laryngotracheitis

Nine outbreaks were confirmed in the Winter Rainfall Region. The disease was controlled by a live virus vaccine, produced by the Veterinary Research

Institute. A total of 1 525 223 doses of vaccine were used on 29 farms in the Winter Rainfall Region.

Rinderpest

This disease does not occur in the Republic.

Newcastle disease

The disease position improved slightly in the year under review in that the outbreaks occurred mainly in small poultry holdings and backyard flocks not protected by the recommended vaccination programmes. The Cape East and Karoo Regions remained free from infection.

Outbreaks occurred fairly regularly in consignments of imported birds at the Jan Smuts Quarantine Station. There seems little doubt that these consignments contracted the disease while passing through the hands of continental dealers, because symptoms invariably developed 3 to 7 days after arrival. Birds at the quarantine stations at Jan Smuts and Irene were routinely inoculated.

The Onderstepoort Newcastle disease vaccine was, until recently, prepared from the Komarov strain of vaccine virus grown on incubated hens' eggs. This vaccine is now grown on monkey kidney line cell cultures. This adaptation to monkey cells is regarded as original work. The vaccine confers the same good protection as the egg vaccine, while eliminating any danger of pollution with other infectious agents possibly transmitted in hens' eggs (e.g. cancer viruses). This tissue culture vaccine has been thoroughly studied, tested and found to be a highly sophisticated product of considerable value.

A further improvement of the Komarov tissue culture vaccine was brought about by the discovery that the Komarov strain consists of more than one Newcastle disease virus type. Two types have been isolated by means of the plaque selection technique in monkey kidney line cells. At present the two types are recognised on difference in size of the plaques and the smaller plaque type has been found to be more virulent in chicks than the larger one. Comparison of the plaque types as vaccines is now being carried out.

Bacillary white diarrhoea (B.W.D.) and fowl typhoid

One outbreak of B.W.D. and 34 of fowl typhoid (one in a certificate-holding flock) were reported during the year.

Data of tests performed in respect of these two diseases are summarised below:

Flocks tested	85
Birds tested	1 423 539
Positive reactors	52
Suspected reactors	15
B.W.D. and F.T. free certificate holders	83
Birds in certified flocks	2 264 534

Attempts were made at the Research Institute to determine the nature and mechanism of immunity in fowl typhoid, by the application of immunosuppressive drugs. The results indicate that the immunity to *Salmonella gallinarum* after administration of a live avirulent vaccine is primarily dependent on a cellular immune mechanism.

Fowl cholera

No outbreaks were reported during the year.

Psittacosis

Two outbreaks were confirmed to the Transvaal and the birds treated with antibiotics. Ten suspected outbreaks were recorded in imported birds at Jan Smuts quarantine station. As all birds were already under routine antibiotic treatment the diagnosis could not be confirmed.

Scrapie

One case of scrapie was confirmed in the O.F.S. Region this year. There was a change of policy regarding the control in infected flocks. Whereas previously all contacts to positive cases were destroyed, it was decided to limit slaughtering to female ancestors and direct descendants. Such flocks are kept under surveillance for a few years and regular inspections carried out. All movements from the farms are subject to permit control.

Equine infectious anaemia

No cases of this disease were reported during the year.

Bovine pleuropneumonia

No cases occurred in the country.

All cattle in the Eastern Caprivi were inoculated as a precautionary measure.

NON-NOTIFIABLE DISEASES

BACTERIAL DISEASES

Mastitis

Mastitis was certainly the most important disease the dairy farmer had to contend with.

In all regions efforts were made, by examination of milk samples and by extension work among farmers, to assist them in diminishing losses from this disease. Bacterial sensitivity tests were undertaken at all regional laboratories and at Vryheid a "Coulter Counter" was donated by farmers to the Department to assist in diagnosis. The main cause of the disease is *Staphylococcus aureus.*

Blue udder

In sheep occurred fairly extensively in the Orange Free State and Winter Rainfall areas. In cases where Pasteurella was identified as the causative organism, vaccination with the Onderstepoort Pasteurella vaccine gave good results.

At the Veterinary Research Institute extensive comparative tests were conducted with various methods of diagnosis of subclinical mastitis in lactating dairy cows.

From these observations it is concluded that the monovalent mastitis tests (MMT) is more dependable and accurate than the conventional cytological methods. With the former test the diagnostician is able to distinguish between true mastitis and teat canal infections resembling mastitis, non-specific cellular reactions and even septic and aseptic mastitis. The development of the MMT may be regarded as a major break-through in mastitis research which hitherto was always hampered by inaccurate diagnostic methods.

Enterotoxaemia

Pulpy kidney presented no problems in flocks where the recommended vaccination programmes were adhered to. It did not occur extensively anywhere.

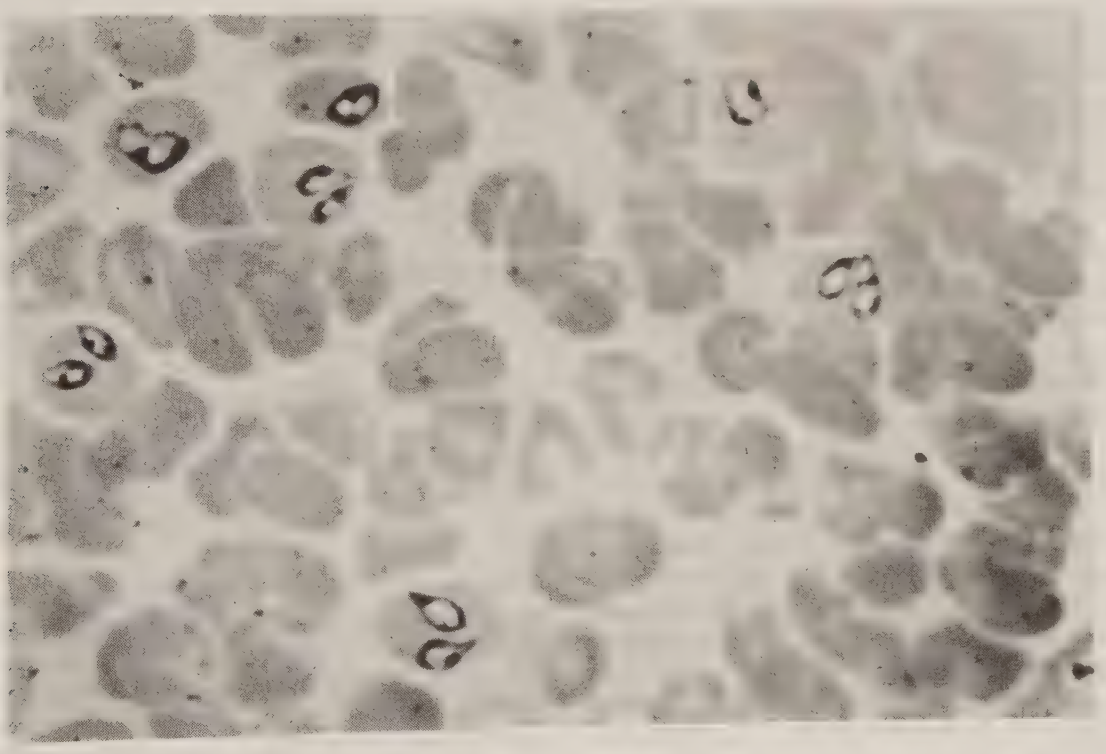
The new Onderstepoort vaccine, in an oil base, which leads to a prolonged term of immunity of up to a year after a single vaccination, will further reduce outbreaks and is a tremendous asset to sheep farmers.

Blackquarter

Outbreaks of blackquarter were recorded in all parts of the country in cattle, as well as in sheep after shearing.

"Lamsiekte" (Botulism)

Sporadic outbreaks of botulism were recorded in all the Regions. In the coastal areas mineral deficiencies led to pica, which resulted in a number of "lamsiekte" cases. Contaminated fodder and feeding of garbage from compounds were also responsible for outbreaks. The vaccine against botulism is very effective.



Redwater parasites in a blood smear. The pear-shaped *Babesia bigemina* parasites are clearly visible in the red blood cells. (2 000 x magnification)

Corynebacteriasis

All Regional reports refer to the occurrence of this disease in cattle and sheep.

At the Research Institute extensive experiments have been carried out in mice and sheep in an attempt to improve the immunogenicity of *Corynebacterium pseudotuberculosis* vaccine.

Immunity could not be enhanced by the simultaneous administration of heterologous live vaccines, neither could this be achieved by intravenous administration of vaccines or by the injection of exotoxin or bacteria grown on special media. The administration of a tenfold concentrated vaccine did, however, give a slightly increased antibody concentration and considerably improved immunity.

While the vaccine against *C. tuberculosis* does not always confer an absolute immunity, it still is of definite value when applied strategically and with the necessary discretion.

Pasteurellosis

Sporadic outbreaks occurred over the greater part of the Republic. Young calves and lambs were mostly affected, especially when under stress, i.e. dramatic changes in temperature, drought, ill-ventilated pens, castration, weaning, etc. Several cases among rabbits were diagnosed in the Transvaal and O.F.S. Regions, leading to substantial losses.

Cases of mastitis in sheep and cattle, caused by Pasteurella, also occurred. When used correctly, the Onderstepoort vaccine gives adequate protection against this disease.

Tetanus

A few outbreaks were recorded mostly in young lambs where the elastrator was used for docking of tails or castration.

The vaccine was used on known infected premises with good results.

Colibacillosis

Escherichia coli infection was the greatest single factor in perinatal calf, piglet and lamb mortality. In poultry it played a role after vaccination, e.g against Newcastle disease, but prophylactic antibiotic treatment gave good results.

Owing to the demand for an *E. coli* vaccine for pigs a vaccine was developed at the Research Institute which contains six of the most commonly encountered serotypes among pigs. These strains were all isolated from recent outbreaks. The vaccine has only been issued for one month, but good reports have been received on its efficacy during the experimental period.

Twenty experimental vaccines were prepared this year for use in cattle, pigs and rabbits, in cases where the Onderstepoort vaccine did not protect against the prevalent serotype on the farm.

The results, where these vaccines were used together with improved hygiene and management, were excellent.

Leptospirosis

At the Regional Veterinary Laboratory, Stellenbosch, 114 of the 1 641 specimens examined for leptospirosis were found positive and at Onderstepoort cattle, pigs, horses and dogs proved positive to a wide range of serotypes.

No definite proof has been presented that leptospiral infection is of much economic significance in the Republic.

Vibrionic dysentery of pigs

Outbreaks were recorded in the Highveld, Natal and Winter Rainfall Regions and appeared to be important where hygiene in piggeries was not up to standard. The indiscriminate use of low-level antibiotic medication and the excessive use of water in infected sties were to blame for antibiotic resistance and the spreading of infection.

Pseudomonas infection

In the O.F.S. Region the organism was proved to be the cause of mastitis in cattle. An outbreak in lambs was recorded in the Highveld Region.

Lamb dysentery ("Bloedpens")

No cases were recorded this year.

Actinobacillosis and actinomycosis

Both conditions occur sporadically, but were of little significance.

PROTOZOAL DISEASES

Babesiosis

Redwater in cattle was again most prevalent in the coastal areas of the Eastern Cape, Natal and Transvaal Regions where it was of great economic importance. The incidence of redwater seems to be rising in the Transvaal Region.

In the Eastern Transvaal, Highveld and O.F.S. Regions a limited number of outbreaks occurred. In the O.F.S. Region the incidence seemed to be higher in the Eastern Free State than elsewhere. Frequent outbreaks were encountered in the eastern coastal strip of the Winter Rainfall Region, especially in the vicinity of Mossel Bay. Elsewhere in this Region only sporadic cases occurred.

At the Veterinary Research Institute attempts are being made to increase the infectivity of the vaccine. It was found that 10 million *Babesia bovis* organisms per dose of vaccine will be necessary to ensure infectivity of the vaccine upon delivery. This will necessitate a high level of parasitaemia in the splenectomised donor animals which is seldom attained for more than 4 weeks after infection. The *B. bigemina* strain incorporated in the vaccine maintains a satisfactory level of parasitaemia in the carrier splenectomised donors for approximately 2 months after infection.

Drugs recommended to control redwater vaccine reactions are unsatisfactory. Some are difficult to administer by laymen and others were found to destroy the parasites in the blood, at the recommended dosage, and consequently also the immunity.

Both *B. bigemina* and *B. bovis* have been transmitted successfully with South African strains of *Boophilus microplus.* It was found that *B. bigemina* is transmitted to the bovine by the nymphal and adult stages of the tick. *B. bovis* is transmitted only by the larval stage. Transovarial transmission occurs in the adult tick in both parasites.

In the Port Shepstone and Ixopo districts of Natal mortality in cattle owing to redwater has increased at an alarming rate during the past decade. Tests carried out at a number of dipping tanks in the Ixopo, Port Shepstone, Umzinto and Harding districts during the last three years have revealed that resistance of the prevalent tick species against the dips used was not a serious problem and that only 18 per cent of the dip tanks tested were up to the required strength.

It was also found that the occurrence of the Asiatic blue tick *Boophilus microplus* is widespread in the four districts mentioned and may be an important transmitter of both species of redwater parasites, *Babesia bigemina* and *B. bovis.*

Furthermore, it appears that short-interval dipping leads to suppression of the carrier ticks, to the stage that maintenance of the redwater parasites becomes erratic, with consequent loss of immunity in the host animals.

Redwater can be controlled in this problem area by the use of an effective vaccine, providing tick control does not disturb the epizootiological balance of the *Babesia* parasites.

The alternative would be absolute tick control, which would effect reduction of tick life to a stage that the redwater parasites are exterminated. This would create the disadvantage of fully susceptible herds and the intensified use of insecticides leading to possible resistance.

Canine biliary fever was prevalent in most parts of the Republic.

Equine biliary fever occurred in isolated instances in the Piet Retief, Johannesburg, Bloemfontein and Mossel Bay areas.

Anaplasmosis

Gallsickness was widespread in the Republic. In the Bloemfontein, Vryburg, Upington and Kroonstad areas severe and peracute outbreaks, which did not respond readily to treatment, occurred.

As a result of the production of a more effective vaccine at Onderstepoort the production of anaplasmosis vaccine at Allerton was discontinued.

Besnoitiosis

No spread of elephant skin disease was reported eithin or from the known enzootic areas. In the Rustenburg area, however, an increased incidence over previous years occurred.

Studies on the development of a living vaccine against bovine besnoitiosis were continued at the Research Institute. In the field trials it was found that 97 per cent of cattle vaccinated 3 years previously with a dose of 1 000 000 organisms were still protected against the subclinical form of the disease. None of the vaccinated animals developed clinical infections. Because of the excellence of these results and the fact that it was unpractical to produce commercially a vaccine containing so many organisms, it was decided to conducts small-scale laboratory and field trials in which the efficacy of a vaccine containing one-tenth of the number of parasites was compared with the above-mentioned dose. The parasites were grown in an established cell line instead of primary cells.

The results of the laboratory trial, in which vaccinated cattle were challenged after 3 months, were comparable to those obtained previously and are therefore satisfactory. The same applied to the field trial in which 100 per cent of cattle vaccinated with the higher dose and 87,5 per cent of those that received the lower dose were protected from subclinical infection one year after vaccination. No clinical cases occurred in any of the vaccinated animals.

Coccidiosis

Sporadic outbreaks occurred in cattle, calves, sheep, lambs, poultry and rabbits. An outbreak also occurred in a herd of springbuck near Calvinia. The highest incidence in sheep and cattle were in feedlots and on artificial pastures.

VIRUS DISEASES

Bluetongue

Isolated outbreaks of bluetongue were recorded throughout the Republic. Despite the warm, dry summer, severe outbreaks occurred in the Eastern Free State. In the Highveld Region a few cases occurred among vaccinated sheep.

Horsesickness

Two outbreaks each were reported in the O.F.S. and Highveld Regions. The dry summer coupled with extensive use of the Onderstepoort vaccine prevented the disease from taking the same toll as reported previously.

Heartwater

In the coastal areas of the Eastern Cape, the Rustenburg and Potgietersrus areas and the whole of the Eastern Transvaal Region, heartwater was the most important killer in cattle. This disease was also diagnosed in the higher-lying regions of the Vryheid district. In the Mossel Bay and Mafeking areas and along low-lying rivers and in the coastal areas of Natal, the disease took its usual toll. In connection with research on this disease, Onderstepoort reports as follows:

The strain of *Cowdria ruminantium*, mentioned in the previous report, which was derived from a goat and has now undergone 110 serial passages in mice, shows no reduction in pathogenicity for mice and/or sheep.

As a result of previous findings that sheep and cattle developed a measure of immunity after inoculation with the mouse-adapted strain of heartwater, further inoculation trials were carried out with infected mouse liver in cattle. The results revealed that the material does not confer sufficient protection and that the immunogenicity in heartwater is associated with the virulence of the organism, i.e. its ability to cause the disease.

At this stage it does not appear that an attenuated strain of the organism would be of any use as a vaccine.

Experiments to determine the nature of immunity in mice and electron microscopic studies on the organism are continuing.

Ephemeral fever

Isolated cases of this disease occurred in all Regions except the Eastern Transvaal and Winter Rainfall Regions. No serious losses were reported.

Rift Valley fever and Wesselsbron disease

No cases of these diseases were reported.

"Snotsiekte"

Sporadic outbreaks of bovine malignant catarrh occurred in the Fauresmith and Rustenburg areas.

"Jaagsiekte"

This disease, as in the previous report, was not troublesome in Griqualand East, although it does occur. One outbreak was reported from the Kimberley area in Karakul sheep and a few cases were found in Namaqualand in the Winter Rainfall Region.

Virus pneumonia of pigs

Isolated outbreaks were reported from the Vryburg area of the O.F.S. Region.

Equine rhinopneumonitis

No cases were recorded.

Infectious ophthalmia

A large number of severe outbreaks of this disease were encountered in cattle and sheep in the O.F.S. Region. Antibiotics had to be used with Vit. A to clear up the condition, whereas in the past antibiotics alone sufficed.

"Vuilbek"

Outbreaks of contagious pustular dermatitis were recorded in sheep and goats in the Bloemfontein and Kimberley areas of the O.F.S. Region, without serious losses.

INFERTILITY AND VENEREAL DISEASES

General

A large number of herds and flocks were examined during the year for lowered fertility. It seemed that the stress caused by intensification of farming and malnutrition plays an increasingly important part in specific and non-specific infections of the reproductive tract in cattle.

Bad managerial practices including lack of proper records also contributed to poor reproduction results.

Vibriosis

Vibriosis was widespread in the Republic. Artificial insemination was used to control the disease. The high incidence of vibriosis found by the A.I. Section in pedigree herds caused alarm.

At the Vererinary Research Institute more than 3 400 specimens of sheath washings and vaginal nucus were examined for *Vibrio fetus venerealis.* Seven per cent of bulls and 12 per cent of all female animals examined were found to be infected.

Very promising results were obtained with the trivalent water-in-oil emulsion type vaccine. Because the original vaccine tested during 1971/72 gave problems with administration, both lipophylic and hydrophylic emulsifying agents were included in the present vaccine. Heifers inoculated with this vaccine 18 months previously were still able to resist heavy experimental challenge with *V. fetus venerealis* strains.

Trichomoniasis

Isolated cases of *Trichomonas fetus* infection were diagnosed in some of the Regions. The diseases was of very little significance.

From the 1 431 washings examined for *T. fetus* at Onderstepoort the organism could be isolated in six per cent of the samples. The majority of washings originated from herds where the presence of vibriosis was suspected on clinical grounds.

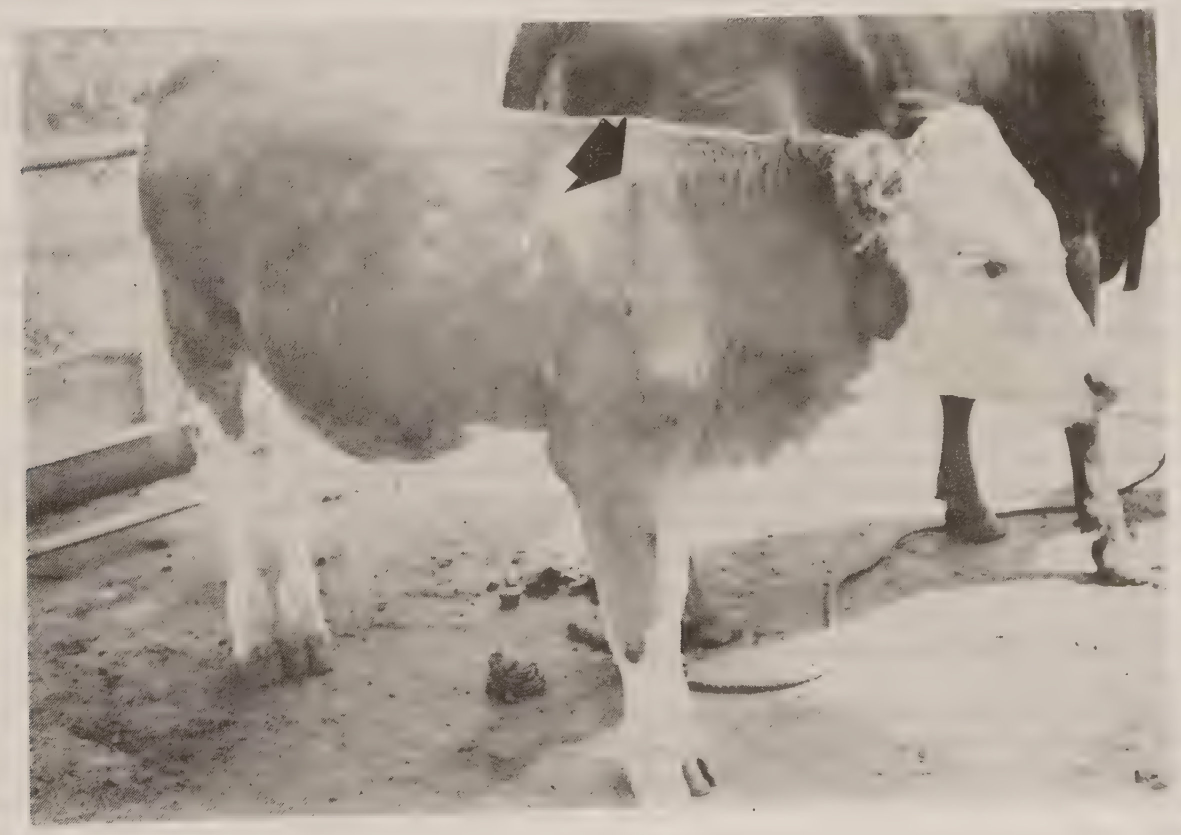
I.P.V./I.B.R.

Infectious *pustular vaginitis* and infectious *bovine rhinotracheitis* have been diagnosed in their I.P.V. form in many parts of the Republic over the years. The significance of the condition has not yet been proven beyond doubt, since clinical manifestations are very seldom seen in proved infected herds.

Chlamydiosis

Abortions caused by the chlamydia organism did not occur to the same extent as during the previous year. In the O.F.S. Region several severe outbreaks of abortions as well as the birth of dead or weak lambs and calves occurred.

Calves apparently normal at birth, also died of severe oedema of the lungs shortly after having suckled for the first time. Outbreaks were also recorded in both sheep and cattle in the areas of Calvinia, Pietersburg, Bethlehem and Kroonstad.



Ox showing typical spontaneous bleeding from the shoulder due to the activity of an adult *Parafilaria* worm under the skin

Rams with marked epididymitis were obtained by the Research Institute from a flock in the North-Western Cape. These rams were negative throughout for *B. ovis* and *Actinobacillus seminis.* On closer examination it appeared that all these rams excreted *Chlamydia* organisms in their semen. On slaughter the organisms could be recovered from various parts of the genital system. These isolates were experimentally administered to adult rams. Although the organisms could be isolated from the semen of these rams up to 90 days after infection, typical lesions of epididymitis could not be produced. Comprehensive studies are now being undertaken on the pathogenesis of these isolates.

The confirmation of enzootic abortion in sheep by isolation of the organisms in incubated hens' eggs has been achieved. In this way it has also been established that abortions in other species such as horses, cattle and goats are caused by the same organisms. The organisms were also isolated from cattle and sheep showing a variety of lesions such as enteritis, pneumonia, arthritis and nervous symptoms. Mortality as a result of *Chlamydia* infection has also been determined in springbuck, giraffe and guinea pigs. Ophthalmia in horses and a dog could also be ascribed to this organism.

All strains of the organisms originating from different animals are very similar and are readily grown on tissue culture. Preliminary trials with a vaccine in cattle have given promising results. An enzootic abortion vaccine for sheep was released by the Research Institute during April 1973.

Actinobacillus seminis

The O.F.S. Region reported that this organism which is believed to cause epididymitis and sterility in rams was prevalent throughout the Region. Experiments to find a suitable method of infecting rams with *A. seminis* continued at the Research Institute, but all further attempts to cause epididymitis with this organism have failed.

Even attempts after reducing the resistance of the testis by exposure to heat, high doses of oestrogen, testosterone and cortisone followed by injection and local administration of *A. seminis* were not successful. The possibility of rams becoming infected at a very early age and only manifesting lesions after puberty has still to be investigated.

Mycoplasma infection in the genital tract of cattle

At the Research Institute studies on the role of these organisms in infertility were again undertaken during the year. Mycoplasmas were isolated from 31 per cent of sheath washings taken from 1 431 bulls. Similar strains were found in semen and testicular tissue of bulls with marked epididymitis. The classification of these isolates is incomplete and fraught with problems. The immunofluorescence technique at present being developed should simplify the identification of pathogenic and saprophytic strains of the organism.

Investigations on perinatal deaths

Sheep and goats

Extensive investigations in perinatal deaths have again been undertaken during the year. The incidence of Chlamydiosis was much less than during the 1972 lambing season. *Chlamydia* organisms could be identified in only 33 per cent of 199 sheep foetuses, while during the 1972 season 85 per cent of the foetal tissues examined were positive.

As the enzootic abortion vaccine is now freely available, it is expected that the incidence of this disease will show a further decrease in the coming lambing season. *Vibrio fetus intestinalis* (Serotype OII) was isolated only from one outbreak, while tests for *Toxoplasma, Brucella, Listeria, Leptospira,* non-specific bacteria and virus infections were negative throughout.

In three outbreaks (two in the Western Transvaal and one in the North-Western Free State) organisms were recovered from vaginal fluid and placentas of ewes that had aborted, which morphologically strongly resembled *Brucella.* These flocks, however, were consistently negative to tests for *B. abortus* and *B. ovis.*

From vaginal fluid of ewes which had aborted and from semen of rams in these flocks an organism was isolated belonging to the Mycoplasma group. The abortion-inducing properties of these isolates are now being investigated.

Fifty-nine goat foetuses were examined during the same period. In three outbreaks *Brucella* was isolated while 40 per cent of all other abortions in goats could be ascribed to Chlamydiosis.

Cattle

During the past year material from 364 foetuses, stillborn calves and calves which died shortly after birth was examined. This material originated from farms in all four provinces.

In 39 outbreaks (11 per cent of the total) *Brucella abortus* was identified.

In a further 4 outbreaks *Vibrio fetus* (both serotypes) was found. As against this *Clamydia* was found in 146 outbreaks (40 per cent of the total). In a few cases the latter was found together with *B. abortus* and *Vibrio fetus intestinalis.*

Routine serological investigations on the incidence of Brucellosis in bovine herds has again indicated that this condition is still fairly common. Fourteen per cent of the 10 113 sera tested showed positive titres.

Tests for Toxoplasma, Listeria, Mycoplasma, fungus and virus infections were negative throughout, as were those for Leptospirosis. Although this organism could not be isolated from foetal tissue, serological investigations (micro-agglutination tests on 1 856 sera) indicated that particularly *L. pomona* could be held responsible for some abortions.

The role of the *Herpes* group of viruses in perinatal mortalities is also still not clear. Although 60 per cent of cows from herds showing abortions, have positive I.P.V. titres the virus could not be isolated from aborted foetuses. These investigations are continuing.

DISEASES OF CALVES

White scours

As in previous years *Escherichia coli* infection caused serious losses throughout the country, especially in dairy herds where the hygiene and management were not of a sufficiently high standard.

In the Winter Rainfall Region pathogenic strains have become resistant to just about every type of anti-microbial available. Investigation into this phenomenon was given high priority at the Regional Veterinary Laboratory at Stellenbosch. Several pathogenic strains, not incorporated in the vaccine issued by Onderstepoort, were found. Pure cultures of these strains were sent to Onderstepoort and experimental autogenous vaccines prepared for use on the specific farms. Vaccination of pregnant cows with these vaccines, coupled with improved hygiene and management, gave excellent results.

Paratyphoid

Sporadic outbreaks were reported from all parts of the country. Many farmers have resorted to individual calf-pens or movable pens, to improve hygiene, with excellent results.

Intensive experiments with guinea pigs and rabbits have been undertaken at the Research Institute, in order to find a valid method for assaying the potency of paratyphoid vaccine.

Certain phenomena concerning the immune mechanism are being explored further and should lead to a better understanding of the nature of the immunity in *Salmonella* infections.

It has also been discovered that the strain of *S. typhimurium* used in the preparation of paratyphoid vaccine is ineffective in mice. This strain is now being compared with other live rough mutants as well as with killed vaccine.

Coccidiosis

Isolated outbreaks were recorded throughout the Republic. In the O.F.S. Region outbreaks in calves in beef herds under ranching conditions presented problems as far as treatment was concerned, but once this was overcome, a rapid cure was effected. Outbreaks also occurred in the Vryheid area of the Natal Region.

Calf diphtheria

Isolated outbreaks were recorded in the Highveld and Transvaal Regions.

Sweating sickness

Sweating sickness was not as prevalent as in the previous year. In Northern Natal and Zululand the disease occurred rather extensively.

In the O.F.S. Region sporadic cases were recorded in the Bloemfontein area and the Molopo area of the Vryburg region. The Transvaal Region reported that the incidence was lower than in previous years except in the Pretoria area where the disease was fairly prevalent. In the Potchefstroom area of the Highveld Region several cases were reported. No outbreaks occurred in the Winter Rainfall Region.

Virus pneumonia of calves

This condition was recorded in the Pietermaritzburg area of the Natal Region in calves in an intensive rearing project.

DISEASES OF POULTRY

Infectious bronchitis

The extensive use of infectious bronchitis vaccine resulted in the disease incidence being of minor importance. Cases were, however, reported in the Transvaal and Winter Rainfall Regions.

Infectious coryza

At the Veterinary Research Institute a bacterin has been prepared as a vaccine against this disease, with the use of different adjuvants. Preliminary observations indicate that, although the vaccine with aluminium hydroxide as adjuvant does not protect against sinusitis, it does reduce the incidence of air sac inflammation and the drop in egg production.

A field trial with oil adjuvant vaccine gave better protection against sinusitis than with aluminium hydroxide adjuvant. The development of this vaccine is fortunate, since the disease is becoming a serious problem in laying hens.

Research on the typing of *Haemophilus gallinarum* in South Africa has so far revealed three specific groups, with possibly more to come.

Mycoplasmosis

The advisability of a six-monthly interval between tests for mycoplasmosis is being questioned by the Regional Veterinary Laboratory, Stellenbosch. It has been found that in some cases, contrary to the accepted theory, possibility of transmission of Mycoplasmosis by day-old chicks is not extremely low, particularly in the case of recent infection of breeding stock.

Fowl pox

Isolated outbreaks were reported by the majority of the Regions. Owing to the effectivity of the vaccine the disease was of no real significance. Pigeon pox was prevalent in the Rustenburg area of the Transvaal Region.

DEFICIENCY AND NUTRITIONAL DISEASES

From the Highveld, O.F.S. and Winter Rainfall Regions it was reported that nutritional diseases, as a result of the severe drought, played a major role.

In the Highveld Region the practice of substituting poultry manure for roughage in drought feeding of cattle led to deficiencies of vital trace elements with subsequent losses.

The O.F.S. Region reported aphosphorosis as widespread with very often resultant low fertility in dairy herds. Magnesium deficiency occurred in sheep on green grazing. When sheep were grazed on oats the animals did not respond to magnesium supplementation alone. Odd cases of "domsiekte" were also seen. Iron deficiency again showed up in young piglets. In the Vryburg area calves were found to consume large amounts of sand and liver analyses surprisingly revealed serious deficiencies of copper, zinc and manganese. In the Upington area an outbreak of ketosis occurred in cattle while in transit and 60 sheep, overfed on concentrates, developed acidosis.

In the Winter Rainfall Region, especially in the coastal areas, copper and cobalt deficiencies remained the most serious nutritional problem. Manganese deficiency also occurred. The Regional Veterinary Laboratory, Stellenbosch, diagnosed trace element deficiencies and metabolic imbalances on certain farms. A total number of 4 116 trace element and 13 731 blood analyses were done at the laboratory.

Phosphate deficiency has again been associated with retained placenta in the Ixopo area of the Natal Region. This condition disappeared immediately after phospate supplementation. Deficiencies of vitamins A and B also occurred in this Region. The Allerton Regional Veterinary Laboratory continued its study on the metabolic profiles of farms in certain areas. Ketosis and milk fever occurred in dairy herds. In the Kruger National Park a survey of trace elements was completed, which indicated deficiencies of copper, iron and zinc, as well as marginal readings for cobalt, manganese and magnesium. This work was done on a total of 1 476 samples taken from 15 species of game.

In the Transvaal Region aphosphorosis was the most important mineral deficiency.

The Veterinary Research Institute reports as follows in connection with nutrition:

Mineral imbalances of ruminants in South Africa

Following extensive investigations in the use of plant and animal tissues it was concluded that liver mineral analysis using atomic absorption spectrophotometry was a reliable method of evaluating the mineral balance in animals.

Samples emanating from seven major regions indicate that the trace mineral most frequently deviating from normality is copper, with deficiencies often being evident in the Cape Coast, Natal and Orange Free State. Manganese was found to be inadequate in the Cape Coastal area, Natal and Swaziland. Zinc was inadequate in the Cape Coast, Natal and Swaziland. Magnesium was found to be deficient in Natal and Eastern Cape, whereas cobalt was deficient in the Orange Free State and Natal.

The recognition of mineral excesses such as selenium, copper and fluoride in certain localities prevents the empirical recommendation of all-inclusive licks, which will further overload such excesses with the related disadvantages to livestock.

The long-term benefit of this work will be the application of low-cost tailor-made licks specific to the requirements of a locality.

Cerebro-cortical necrosis in ruminants

This condition has long been known to occur in foreign countries. Some sporadic cases of the disease have been observed in sheep and cattle in South Africa in the past. During the last few years fairly extensive mortalities in sheep as a result of the disease have occurred on artificial pastures in the Western Cape.

The disease is associated with a thiamine deficiency and good results are obtained with thiamine treatment in affected animals. Further investigations are contemplated on the factors precipitating the condition, in an attempt to find effective prophylactic measures.

POISONING

Mineral poisoning

Numerous cases of poisoning were reported from all Regions, in several instances accompanied by heavy mortality. Many cases resulted from the incorrect or negligent use of such elements as salt, urea, trace element licks and acaricides; the accidental or malicious administration of acaricides or other insecticides; and the ingestion of harmful substances such as lead, strychnine and nitrates.

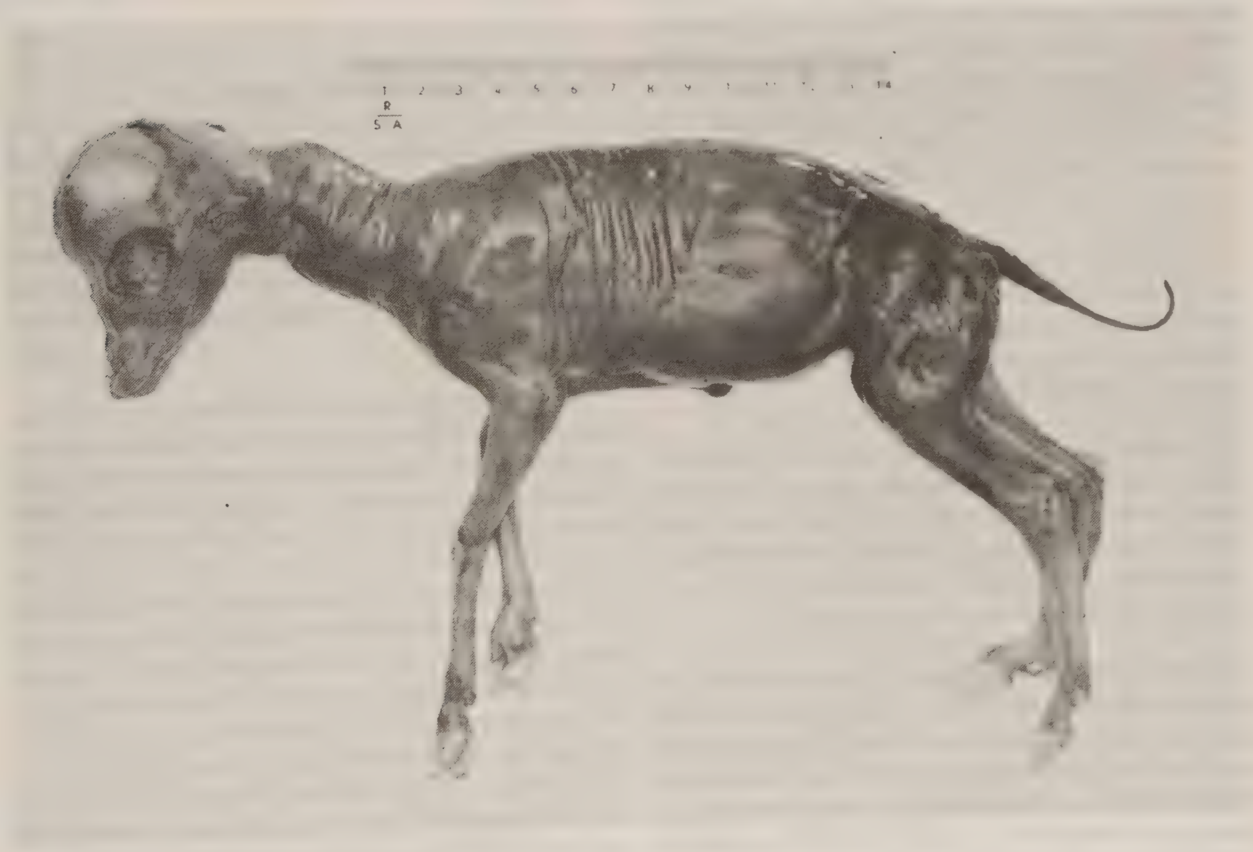
In one of the worst cases 80 ewes were lost in the Winter Rainfall Region as a result of arsenical poisoning. In the Eastern Transvaal and Transvaal Regions 10 and 17 cattle, respectively, died as a result of hand-dressing with an overstrength arsenical mixture. Cases of arsenical poisoning also occurred in the other Regions.

Spraying with agricultural insecticides led to the death of 39 head of cattle in Lydenburg in the Eastern Transvaal, and 22 died in the Pietersburg district as a result of organo-phosphate dipping. In the Barberton district deposits of smoke and dust from an adjacent mine on grazing led to the death of 7 cattle as a result of chronic arsenical poisoning.

In the Highveld Region 54 sheep died as a result of ingestion of a mixture of Methyldehyde and Karbaril. In the Hoopstad area 8 cattle died from lead poisoning. Severe chronic fluoride poisoning occurred on a farm situated near a factory in the Winter Rainfall Region. Several cases of salt poisoning in pigs and poultry occurred in this Region.

Lead poisoning caused the death of 7 head of cattle in the Ermelo district of the Transvaal Region and urea killed 29 head. In the Pretoria area 15 cattle died from sulphur poisoning after having had free access to trace element licks. Strychnine poisoning of dogs occurred in all the Regions.

At the Research Institute chronic copper poisoning was reproduced by feeding small amounts of copper sulphate (5 mg/kg body mass) daily to sheep for



Aborted ovine foetus as a result of *Chlamydia* infection

many months. The chronic copper poisoning so produced resembled enzootic icterus in many ways as far as the symptoms, chemical pathology and pathology were concerned. Future research into the aetiology of enzootic icterus will therefore be based on the assumption that this disease is a chronic form of copper poisoning and the reasons for its occurrence will be investigated.

Outbreaks of enzootic icterus in sheep were recorded in the O.F.S. Region in the Fauresmith, Upington and Kimberley areas.

Plant poisoning

Plant poisoning took the usual toll during the year. According to the Regional Reports, the following were the major causes of stock deaths:

Tulp *Homeria* and *Moraea* spp. in all seven Regions; *Senecio* spp. in the O.F.S., Transvaal, Highveld, Natal and Eastern Cape and Karoo Regions; gousiekte *Pachystigma, Fadogia* and *Pavetta* spp. in the Transvaal, Highveld and Natal Regions; *Crotalaria* spp. in the O.F.S. and Transvaal Regions: vermeerbos *Geigeria* spp., slangkop *Urginea* and *Ornithoglossum* spp., and malkopui *Dipcadi glaucum* in the O.F.S. Region; *Lantana camara* and gifblaar *Dichapetalum cymosum* in the Transvaal Region; *Sarcostemma viminale, Galaenia africana, Cotyledon spp., Euphorbia spp., Asaemia axillaris, Hermannia paucifolia, Phalaris* staggers and oxalis poisoning in the Winter Rainfall Region; *Lasiosiphon spp.* in the Highveld Region; *Pteridium aquilinum* in the Eastern Transvaal Region; and *Nerium oleander* in Natal.

Poisoning of stock as a result of ingestion of *Pyrenacantha grandiflora* was recorded for the first time in the Dundee area of the Natal Region. Prussic acid poisoning and photosensitization were recorded in the O.F.S. and Highveld Regions.

During the year at the Veterinary Research Institute two new toxic plants were discovered. Seeds of *Pyrenocantha grandiflora* Bail. (Icacinaceae) were found to be lethal to sheep when administered at comparatively low doses. The *post mortem* changes somewhat resembled those of heart failure.

The other plant poisoning was responsible for outbreaks of amaurosis (blindness) and paralysis among sheep and cattle in South-West Africa. The cause of this condition was found to be *Helichrysum argyrosphaerum* ("sewejaartjie" or "everlasting"). When *Helichrysum* plants from the affected pastures were fed to a sheep it developed paralysis, and although not blind, the typical spongy lesions seen in field cases were present in the brain and optic fasciculae.

The plant is widely distributed throughout South Africa and this plant poisoning can be of considerable importance where *Helichrysum* is extensively grazed e.g. in arid areas such as South-West Africa.

"Maldronksiekte" (Solanum poisoning) in cattle

This extraordinary disease in cattle was first observed in 1955. It occurs in a limited area in the Rustenburg district near the confluence of the Groot-Marico and Crocodile Rivers. The disease is characterised by nervous symptoms, mainly inco-ordination of movement and disturbance in balance. When affected animals are disturbed or frightened they drop down and struggle for several minutes before apparently recovering.

Animals suffering from this condition, even in latent form, cannot be marketed and many have to be destroyed as a result of injuries sustained when falling.

During the past year it was confirmed that this disease is caused by the plant *Solanum kwebense* (a kind of bitter or "poison apple"). The disease was produced experimentally at Onderstepoort with this plant. The plant concerned encroaches on the buffalo grass *Panicum maximum* under trees under conditions of overgrazing.

Diagnosis of heart glycoside poisoning

Heart glycosides are the toxic components of, amongst others, species of "tulp", "slangkop" and cotyledons and are such powerful toxins that with mortalities as a result of these poisonous plants, minute quantities only of these substances are present in the carcases (about 50 ng/g or 50 parts per thousand million parts of tissue).

It is hardly possible to detect such minute quantities with conventional chemical methods and, as no other specific changes are found at *post mortem* and microscopic examination, a definite diagnosis could never be made.

The adaptation of a fairly simple but somewhat time-consuming enzyme inhibition technique, using human red blood cells to confirm this type of poisoning, may be regarded as a considerable break-through. For the first time this type of plant poisoning can now be diagnosed or confirmed with absolute certainty.

A number of field cases have been diagnosed in this way and in two outbreaks, which were strongly suspected to be due to dosing with worm remedies, it could be proved that the animals had consumed tulp with fatal results.

Toxins

Isolated cases of *Diplodia zeae* poisoning were recorded in the Natal, Eastern Transvaal, Transvaal, Highveld and O.F.S. Regions.

INTERNAL PARASITES

Internal parasites did not cause severe economic losses this year. Unfavourable climatic conditions limited outbreaks to heavily infected flocks and herds where local conditions were suitable for internal parasites. Tapeworms in young stock played the biggest role in the O.F.S. and Natal Regions; *Haemonchosis* (wireworm) in the O.F.S., Natal, Highveld and Winter Rainfall Regions; nodular worm (*Oesophagostomum spp.*) in the O.F.S. and Natal Regions; brown stomach worm (*Ostertagia spp.*) in the O.F.S., Natal and Winter Rainfall Regions; bankrupt worm (*Trichostrongylus spp.*) in the O.F.S. and Winter Rainfall Regions and *Nematodirus spp.* in the Eastern Cape and Karoo Regions.

Lungworm infestations were recorded in the Natal and Winter Rainfall Regions. In the Winter Rainfall Region cases of liver fluke infestation were not uncommon.

Measles in cattle and pigs led to economic losses in the O.F.S. and other Regions. Liver tapeworm infestation caused condemnation of up to 95 per cent of sheep livers at the major abattoirs in the O.F.S. Region.

Several outbreaks of *Coenurus cerebralis* were recorded in the O.F.S. Region. As an aid in solving problems of internal parasitism, State Veterinarians throughout the Republic examined 30 964 faeces samples.

In the Kruger National Park periodic mortalities occurred in eland in a camp near Pretoriuskop and *Cordophilus sagittus* was found to be the cause. The majority of the remaining eland were captured and treated with anthelmintics with excellent results. An ox and some sheep were artificially infested with ticks from these eland to establish whether ticks could transmit this infestation. Negative results were obtained.

Lingustula nuttali was collected from a lion.

A baboon and a sheep were dosed orally with *Echinococcus felidis* to establish the susceptibility of these animals. It seems as if this parasite cannot be transmitted from the lion to baboons and sheep.

A total of 78 652 specimens from pig carcases were examined for *Trichinella spiralis* at State Veterinary offices and 1 220 from wild animals in the Kruger National Park. All proved to be negative.

The Veterinary Research Institute reports as follows in connection with internal parasites:

Remedies for round worms

The non-parametric (N-PM) worm remedy test of Groenewald and Reinecke is directed towards the statistical comparison of worm burdens in treated and control animals and to predict the effect of treatment on a flock basis. During development of the test it was thoroughly tested out in sheep and by making use of calves; the method has also been applied to the economically important round worm species in cattle.

The method has also been found to be very effective for worm remedy tests in cattle, with the result that this statistical test enables the Registar of Stock Remedies and his technical advisers to evaluate the remedies on purely scientific grounds, and this can be utilised for routine evaluation in cattle as well.

As a result of this important development, the testing and evaluation of remedies against round worms in sheep and cattle in South Africa may be regarded as being among the most advanced in the world. A laboratory guide describing the test in all its facets has been published.

Attempts are being undertaken to make the test applicable to remedies against liver fluke as well.

Gastrodiscus aegyptiacus

This parasite of horses has been further investigated. The eggs are found to hatch over an extended period and not all at once as is normally the case in flukes.

Its most important intermediate host in South Africa, the snail *Bulinus tropicus*, is found to be highly susceptible to infestation up to an age of approximately 4 weeks, after which there is a dramatic drop in susceptibility, so that after 7 weeks it is completely refractory to infestation.

Infested snails shed cercariae from as little as 41 days after infestation and seem to lose the infestation altogether with time as a result of rejection of the parasite.

Research on resistance or partial resistance (e.g. with age) of these snails can possibly lead to methods of control of some of the economically more important flukes, one of which, the conical fluke, has the same intermediate host as *Gastrodiscus aegyptiacus*.

Bilharzia (Schistosoma mattheei)

Diagnosis

The diagnosis of bilharzia in ruminants with existing methods is a tedious and inefficient procedure, dependent on the finding of eggs in the excreta of animals. A special test consisting of the demonstration of antibodies in the plasma of the animal by means of the fluorescent antibody technique has been developed and tested for bilharzia diagnosis. The test is thoroughly specific and no false positive or negative results or cross reactions with other flukes or round worm species have been encountered.

Although there appears to be no correlation between the worm burden and the degree of positive reaction, the method is promising for the purpose of conducting surveys on the presence of infection in ruminants.

Protective action of a liquid soap against infection

A liquid soap containing hexachlorophene, has been used to wash the tails of *Mastomys* rats, after which they were rinsed in running water. Rinsing was carried out in test tubes with water running at the rate of 100 ml per minute for varying periods. Even after a rinsing period of 40 minutes the rats were still protected against infestation.

Although further tests on primates are essential before the results could be applied to human beings, the method appears to be very promising for humans exposed to bilharzia-infested water for short periods only.

Measles in pigs

Measles (cysticerci or bladder worms) in pork are the larval stages of the human tapeworm, *Taenia solium.* These parasites cause grave economic losses because meat infested with measles is unfit for human consumption. Lightly infested carcases can be frozen for extended periods to render the meat safe, but this process is expensive and unpractical.

Research on this parasite is complicated by the fact that eggs, of which many are required in experiments, are difficult to obtain from the human host. Moreover, no laboratory animal is normally suitable for testing the effect of various physical factors (e.g. low temperatures, irradiation) on the infectivity of the cysticerci, while laboratory tests for hatching are not reliable for infectivity.

Preparation of vaccine against enzootic abortion in sheep. The organisms are cultured in incubated hens' eggs

The measle which does hatch may not develop further to give rise to the adult tapeworm. The hamster was used to study the effect of irradiation on the measle. Cysticerci are exposed to irradiation of varying intensities for a certain period and their hatchability in hamsters observed. As the intensity of irradiation is increased, hatchability and subsequent development are retarded up to a stage where the worm is completely resorbed or excreted.

EXTERNAL PARASITES

Ticks created problems throughout the Republic.

In the Transvaal and Natal Regions serious problems were encountered, mainly because substandard concentrations of acaricides were used in dipping tanks.

Lice in sheep were very troublesome in the Eastern Transvaal, O.F.S., the Ixopo area of Natal, and the Winter Rainfall Region. Cattle and pigs were also infested.

Tick paralysis occurred in the Winter Rainfall Region and for the first time in the Bethlehem district of the Highveld Region.

Blowflies were troublesome in the Winter Rainfall Region, Transvaal and O.F.S. No further collections were made of the resistant blowfly strain in the Riversdale district.

Oestrus ovis larvae infested sheep in the Winter Rainfall, Transvaal and O.F.S. Regions and losses were sustained.

In the O.F.S. and Natal Regions biting flies caused irritation of cattle with loss of weight and even a drop in conception rate. Sporadic outbreaks of sheep keds occurred in the Winter Rainfall Region.

In the North-Western Cape areas of the O.F.S. Region sand tampans caused the usual losses, while along the Orange and Vaal Rivers biting midges occurred in large numbers. This was especially so in the Hay and Herbert districts.

During 1968/69 a survey of *Simuliidae* in the Caledon and Orange Rivers indicated that *Simulium chutteri*, an important blood-sucking midge of stock, occurred only in small numbers. This was ascribed to the high silt content of the water. Other species such as *S. gariepensis* were present in large numbers, but as these are mainly parasitic on birds, they are of little economic importance.

The completion and filling of the Verwoerd Dam resulted in a considerable change in the ecological situation in the Orange River below the dam and *S. chutteri* was recently encountered in large numbers, especially in the vicinity of Douglas. It is expected that the *Simuliidae* will become an increasing problem after completion of the large dams in the Vaal and Orange Rivers, owing to enrichment and stabilisation of the water.

Midges have been found as far as Griquatown, about 50 km from the nearest breeding sites in the Orange River, and the entire distribution distance has not yet been determined.

Genetic studies on the Boophilus species of ticks

The Asiatic blue tick, *Boophilus microplus* has spread considerably in Natal during the past decade and has replaced the South African blue tick *B. decoloratus* almost entirely in some areas. Preliminary biological observations indicate that *B. microplus* produces more eggs than *B. decoloratus* and also that the life cycle under identical laboratory conditions is about one week shorter.

The Natal strain differs from the Australian *B. microplus* in this respect and the possibility exists that there are two biologically distinct strains of the same species.

A study of the chromosome composition of these three different blue ticks is being undertaken by the Veterinary Research Institute and preliminary observations indicate a difference in caryotypes.

Studies on *Parafilaria bovicola*

In the search for the transmitter(s) of this worm, flies attracted to blood on cattle at Mara Research Farm near Louis Trichardt, were collected, identified and examined for the infective stage of *Parafilaria bovicola*.

Two species of *Musca* were found to be infested.

The investigations by the Research Institute are now being expanded to include other enzootic areas throughout the Transvaal at regular intervals throughout the warm season.

BASIC VETERINARY RESEARCH

Bluetongue

Hybridisation studies on bluetongue virus serotypes

The messenger RNA of a large number of serotypes of the bluetongue virus is hybridised with double-stranded RNA. Relatively marked differences have been found between the serotypes and in a few instances only the genome segments have been found to be the same in different serotypes. The immunological specificity of the serotypes is apparently located in the second genome segment, while the sixth segment also plays a role. Differences have also been encountered between the virulent and attenuated lines of a serotype.

Electron microscopic studies on the bluetongue virus RNA have revealed that each virion on average liberated about 6 RNA fragments and that a large variation in filament lengths occurs. From this the RNA molecular weight could be estimated.

A number of other viruses (both local and exotic) have been studied electron-microscopically and found to possess morphological characteristics supporting their classification in the group of bluetongue-like viruses.

Isolation and partial identification of temperature-sensitive mutants of bluetongue virus

To date ten temperature-sensitive mutants have been isolated. Four mutogenic agents were used to accomplish this. Preliminary biochemical characterisation of one of these mutants indicates that the genetic differences are discernible. Culturing of the other mutants on a large scale will be required before a comparative analysis of the biochemical properties can be effected.

The effect of cortisol on the immune response of mice to sheep red blood cells

The immune response of mice to sheep red blood cells and the effect of cortisol were studied both by measuring the plaque-forming cells and the mass of mice spleens after administration and by histological examination of the spleen, thymus, liver, lymph nodes and bone marrow. It was found that a significant reduction in plaque-forming cells and in spleen mass occurred after steroid injection, while histologically the thymus, lymph nodes and spleen showed destruction and depletion of lymphocytes. When sheep red blood cells were injected there was active development of lymphocytes associated with the immune response. A clear picture was thus obtained of the effect of steroid treatment on the immune response.

MISCELLANEOUS RESEARCH AND PROJECTS

The registered projects, in connection with which work was initiated or continued during the year, are listed below:

In vitro identification of *Cryptococcus farciminosis* – Grahamstown. *Actinobacillus seminis* infection in sheep – Middelburg, Cape. Biological control of ticks – Windhoek, S.W.A.

I11-thrift in lambs in the Albany and Bathurst districts – Grahamstown. Reproduction of the Cape buffalo *Syncerus caffer caffer* Sparrmann – Kruger National Park.

The drug immobilisation of the Cape buffalo *Syncerus caffer caffer* Sparrman – Kruger National Park.

Coccidiosis of the Cape buffalo *Syncerus caffer caffer* Sparrmann – Kruger National Park.

Chlamydiosis in the Ram – Onderstepoort.

The distribution of the virus of African Swine Fever – Potgietersrus and Onderstepoort.

In the Piet Refief area research on the biology of meercats as it affects the control of rabies continued.

RESEARCH ON DISEASES OF GAME

Research on diseases of game continued in the Kruger National Park. Attempts were made to infect buffalo calves with *Eimeria zurnii,* a coccidia spp. of cattle.

As mentioned in the previous report, oocysts of *Isospora papionis* were found in the skeletal muscles of baboons. A survey to determine the incidence of this condition is being undertaken. Positive cases found were slaughtered and the meat fed to lions, hyenas and domestic cats with the object of determining whether infection could be transmitted.

A *Cytauxzoon sp.* was found for the first time in the Kruger National Park in an eland.

Attention was given to the physiology of the cheetah, especially the heart and lung function and the effect of intensive exercise thereon.

Altogether 454 blood samples, for blood group studies, of various game animals were examined in conjunction with the Zootechnology Department of the Veterinary Research Institute. (With the separation of the Research Institute and the Faculty of Veterinary Science during this year this Department was transferred to the Faculty.)

The project was conducted to provide information on game breeding, inbreeding of game populations and also to try and clarify some uncertainties about taxonomic relationships.

VACCINE PRODUCTION

The number of vaccines prepared by Onderstepoort has increased from 32 to 35 through the addition of vaccines against enzootic abortion in sheep, infectious laryngo-tracheitis in poultry and colibacillosis in pigs. As a result of improvement in quality and lasting properties of gallsickness vaccine, the production of this vaccine at the Regional Laboratory, Allerton, Pietermaritzburg, was discontinued and issuing was centralised at Onderstepoort during the year.

The subjoined list of vaccines and diagnostic agents shows the comparative figures of the number of doses issued during the past three years.

The total number of doses of vaccine issued during the year has increased by 9 per cent from 128 171 316 to 139 891 286, which again represents a record turnover. Since 1969/70 the vaccine issues have increased by more than 46 per cent.

The increase in vaccine issued during the year under review is primarily due to the increased demand for poultry vaccines and the issue of 156 300 doses of enzootic abortion vaccine. Of the poultry vaccines, fowl pox increased from 6,6 to 7,9 million, infectious bronchitis from 2,7 to 4,2 million and Newcastle disease vaccine from 40,8 to 56,5 million doses, an increase of 36 per cent. The demand for bluetongue vaccine, however, decreased by 30 per cent.

Bacterial vaccines

	1970/71	1971/72	1972/73
Enterotoxaemia	31 977 050	30 923 350	31 512 900
Lamb dysentery	307 200	1 070 300	228 250
Brucella (cattle)	1 175 500	1 447 605	1 679 465
Brucella (sheep)	436 650	421 350	407 450
Corynebacterium ovis	224 320	214 820	44 680
Corynebacterium pyogenes	161 520	209 960	249 960
Swelled head	8 150	24 400	29 150
Colibacillosis (cattle and sheep)	25 410	14 940	14 200
Colibacillosis (pigs)	–	–	7 800
Enzootic abortion (sheep)	–	–	156 300
Fowl typhoid	1 567 300	1 785 200	1 846 500
Botulism (Lamsiekte)	4 381 600	3 887 185	4 188 297
Leptospirosis	90	2 352	2 740
Lungsickness	200 000	1 037 571	436 280
Anthrax	11 424 300	12 222 430	10 445 640
Paratyphoid (calves)	264 285	263 638	314 484
Pasteurella	345 160	481 880	682 700
Blackquarter	4 826 314	4 645 638	5 080 916
Tetanus	52 600	60 810	82 460
	57 377 449	58 713 429	57 410 172

Virus vaccines

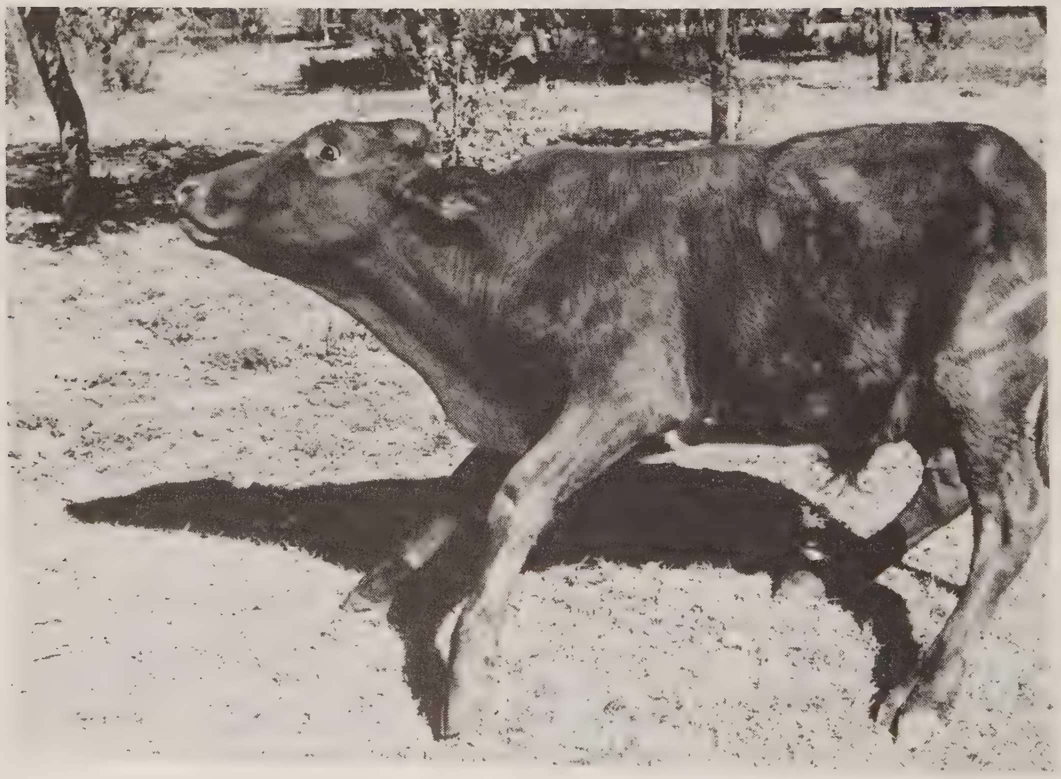
Bluetongue	17 739 650	16 771 600	11 663 700
Pigeon pox	653 000	684 300	797 200
Fowl pox	5 699 000	6 680 800	7 913 600
Distemper (dog and mink)	21 852	21 105	28 286
Rabies (LEP for dogs)	268 136	437 475	247 937
Rabies (HEP for cats)	–	2 936	16 956
Infectious bronchitis (poultry)	–	2 789 200	4 202 400
Infectious laryngotracheitis (poultry)	–	–	–
Lumpy skin disease	328 112	320 538	371 176
Newcastle disease (poultry)	29 019 600	40 846 400	56 550 500
Horsesickness	126 573	128 240	142 199
Rift Valley fever	296 970	105 790	18 896
Wesselsbron disease	410 710	181 450	23 650
	54 563 603	68 969 834	81 976 500

Other vaccines	1970/71	1971/72	1972/73
Anaplasmosis (gallsickness)	444 613	368 642	381 057
Heartwater blood	52 095	52 386	59 402
Redwater	68 623	67 025	64 155
	565 331	488 053	504 614
Grand total (all vaccines)	112 506 383	128 171 316	139 891 286

Diagnostic agents (antigens)

Number of units

B.W.D. antigen	37 290	34 755	43 790
Brucella abortus antigen	–	–	9 800
Brucella ring test antigen	1 191	579	320
Mallein	110	10	10
Tuberculin (bovine)	411 830	670 670	755 170
Tuberculin (avian)	226 250	262 430	313 700



A case of "maldronksiekte", *Solanum kwebense* poisoning

The following vaccines were produced by State Veterinarians in the field:

Anaplasmosis	13 168 doses
Redwater	9 124 doses
Heartwater	5 933 doses
Autogenous wart	1 432 doses
Contagious pustular dermatitis	3 007 doses
Actinobacillus seminis	20 doses (experimental vaccine)

A total of 10 600 ml of leptospirosis antigen was prepared at the Regional Veterinary Laboratory, Stellenbosch.

As mentioned previously, the production of anaplasmosis vaccine at Allerton Regional Veterinary Laboratory was discontinued.

DIAGNOSTIC SERVICES

During the year progress was made with the provision of more efficient and sophisticated equipment for the Regional veterinary laboratories. The new Regional Veterinary Laboratory at Stellenbosch was taken into use in August 1972.

To keep the standard of diagnostic methods used at the Regional veterinary laboratories at the same level a scheme was instituted for periodic exchange of samples between the laboratories.

Laboratory test fees and fees for assistance to the public were revised during the year in order to obtain a more realistic and a uniform schedule of fees for services rendered.

In the course of diagnostic work post-mortem examinations were conducted on a total of 7 267 cattle, sheep, goats, pigs, equines, dogs, cats and other animals by professional officers of the Division and a total of 1 275 at the Research Institute.

On 26 453 poultry post mortems were done by professional officers of the Division and 4 976 poultry post mortems were done at the Research Institute.

At the Research Institute, Regional veterinary laboratories and State veterinary offices, the following laboratory examinations were carried out:

	Regional veterinary laboratories and State veterinary offices	Research Institute
Brucella agglutination tests	710 614	13 897
Brucella abortus comparative tests to eliminate vaccine reactors		7 231
Brucella milk ring tests	206	–
Vibriosis	113	–
Leptospirosis	1 641	1 856
Actinobacillus seminis	18 087	––
Antibiograms	823	206
Skin scrapings	5 349	24
Faeces examinations	30 964	324
Helminth identification	–	253
Mastitis milk examination	7 275	–
Semen	2 682	–
Haematological	1 483	–
Biochemical	52 421	–
Toxicological	612	2 811
Bacteriological	12 767	973
Virological	2 286	835
Protozoological	–	71
Biological	22	–
Histopathological	451	29 769
Trichinella	79 872	–
Smears	60 962	–
Aschheim Zondek	418	–
Johne's disease	–	103
Rabies	–	1 262
I.P.V./I.B.R. serum	–	189
I.P.V./I.B.R. semen	–	52
Chlamydiosis	–	521
Sheath washing	–	4 831
Aborted foetus examination	–	620
Insect identification	–	53
Serotyping of cultures	–	2 904
Total	989 048	68 785

SURVEYS

A tick resistance survey was conducted in the Sibasa district (in conjunction with a private firm).

The State Veterinarian, Pietersburg, continued a survey on the causes of low calving percentages in his area.

The survey to determine the mineral status of several domestic species in the Winter Rainfall Region was continued.

A tick survey in the Ixopo area of the Natal Region indicated that *Boophilus microplus* is widespread in Southern Natal and that it dominated *B. decoloratus* in the ratio of 17:3 in this part of the country.

CLINICAL SERVICES

In those areas where the services of private veterinary practitioners were not available, State veterinarians rendered clinical services, as in the past, when not prevented from doring so by their official duties.

In addition veterinary services were also provided for State-owned herds and flocks. During the year R23 997,58 was collected for professional services, R3 767,33 for transport charges and R14 976,32 for vaccines sold by the State veterinary offices. Laboratory fees amounted to R5 192,67, fees for meat inspection at export abattoirs to R63 442,19, quarantine station fees to R39 773,19 and miscellaneous revenue to R466,81.

ARTIFICIAL INSEMINATION SERVICES

For the annual re-registration of bulls standing at the A.I. co-operatives and individual breeders, and the registration of new bulls intended for A.I. services, the A.I. and Reproduction Section of the Division at Onderstepoort examined 162 bulls this year.

Samples from 15 A.I. bulls were received and tested from Botswana.

An experimental vibriosis vaccine was used on 15 A.I. bulls to exclude the possibility of the vaccine having a detrimental effect on the bulls and the quality of their semen.

At the moment there are 11 I.P.V. positive bulls at A.I. stations. During the year two registered bulls developed positive I.P.V. titres. Semen from I.P.V. positive bulls are subject to regular examinations for the presence of I.P.V. virus but no semen proved positive during the year.

As in previous years, a number of bulls with sperm abnormality counts higher than the statutory 20 per cent, were conditionally re-registered. The bulls maintained entirely satisfactory conception rates.

During 1972 approximately 300 000 doses of semen were sold by the A.I. co-operatives, while 50 000 doses were issued to private breeders. This represented only a portion of the total volume kept at co-operatives for private use of individual farmers. Semen from dairy breeds amounted to 73 per cent, dual-purpose breeds 11 per cent, and beef breeds 16 per cent of all semen sales.

The average conception rate after the first insemination was 74 per cent.

The swing from insemination by inseminators to insemination by the owner or an employee continued, and only 15 per cent of inseminations were done by inseminators.

Four courses, for prospective inseminators, were held at Onderstepoort. Of the 54 students attending 46 qualified.

In addition to these four courses the A.I. and Reproduction Section of the Division presented 4 courses for Non-White farm labourers and 36 of the 51 candidates were successful.

Most of these trained labourers achieved excellent results as inseminators afterwards.

At Potchefstroom 14 A.I. courses were attended by 221 farmers who wished to apply A.I. in their own herds.

Four 10-day courses, were held at Glen by the State Veterinarian, Bloemfontein, and 52 farmers attended.

Several courses were given at Vryheid and Cedara to selected groups of farmers.

At Nelspruit the local study group organised an A.I. course which was attended by 17 farmers.

HEALTH SCHEMES

Bacillary White Diarrhoea (B.W.D.)

Details of tests performed and certificates issued during 1972/1973 are tabulated below:

Region	Tests				Certificates	
	Flocks	Fowls			Number of	
		Total	Pos.	Susp.	Holders	Fowls
Eastern Cape and Karoo	5	3 998	–	–	3	3 989
Highveld	13	51 799	52	–	13	341 818
Natal	11	729 233	–	–	11	729 233
O.F.S.	2	3 805	–	–	2	4 205
Transvaal	25	387 211	–	–	25	356 689
Winter Rainfall	29	247 493	–	15	29	828 600
Total	85	1 423 539	52	15	83	2 264 534

P.P.L.O. Scheme

The data of tests performed are summarised below:

Region	Fowls tested				Certificate holders	Test non-certified flocks
	Total	Pos.	Susp.	Non-specific		
Highveld	3 253	–	–	–	5	510
Natal	6 295	–	–	6	6	74 680
O.F.S.	414	–	–	–	1	–
Transvaal	7 100	–		–	2	1 500
Winter Rainfall	44 014	3 213	117	935	32	–
Total	61 076	3 213	117	941	46	76 690

Pig recording scheme

During the latter part of the year concerted efforts to ensure the efficient operation of this scheme were made, and the membership increased from 42 to 46 during the year. The total number of pigs increased from 18 185 to 34 078.

FOOD HYGIENE

Abattoirs

The Division has recorded a total of 1 438 abattoirs consisting of 1 353 red meat abattoirs, 76 poultry abattoirs and 9 rabbit abattoirs. These abattoirs were distributed as follows:

Natal 243; Cape Province 690; Transvaal 423; and Orange Free State 91. The Animal Slaughter, Meat and Animal Products Hygiene Act, 1967 (Act 87 of 1967), is not applicable to the Transkei other than its urban areas. The above-mentioned figures, therefore, do not include abattoirs in this homeland. The Act does apply to the other homelands, so that abattoirs within their boundaries are included in the figures.

Since the implementation of Act 87 of 1976 the following numbers of certificates of approval have been cancelled owing to the closure of the abattoirs for the purpose of slaughtering stock:

Natal 12; Cape Province 32; Transvaal 20; Orange Free State 5; giving a total of 69.

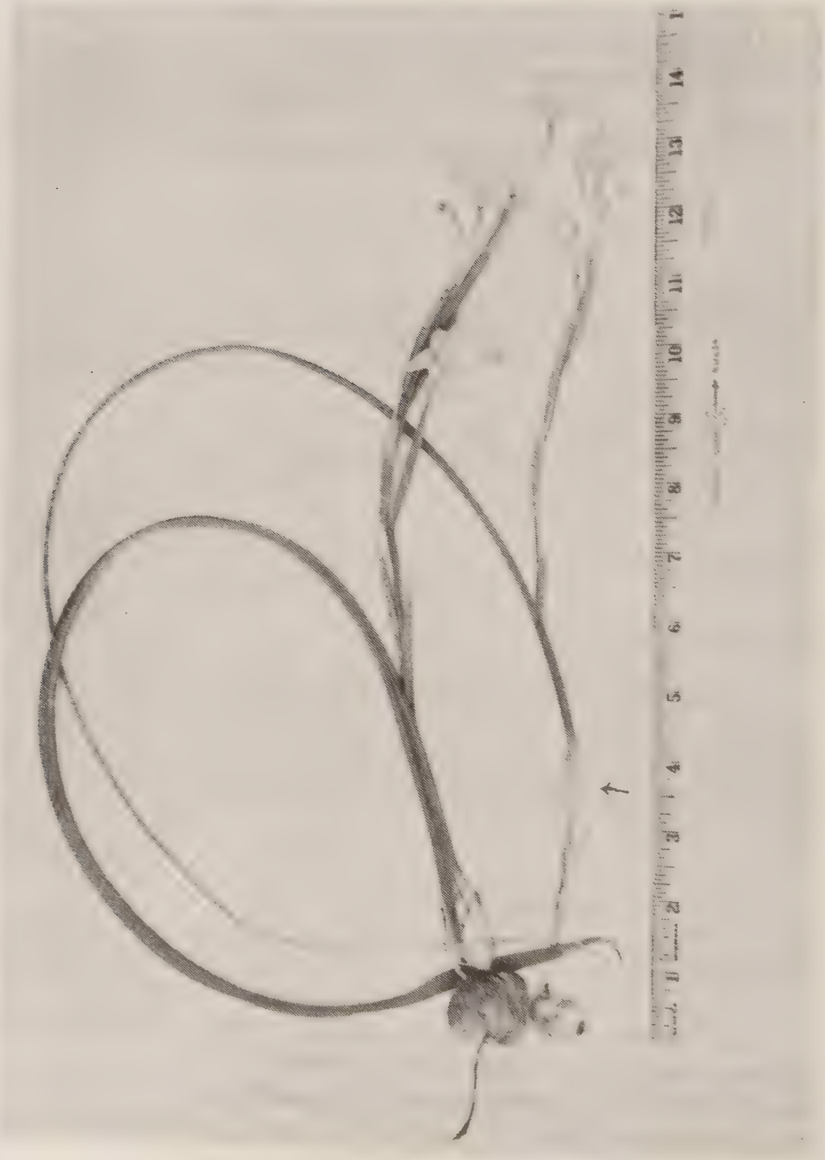
At the commencement of the Act it was necessary to issue certificates of approval to all abattoir owners, whether such installations complied with the requirements of the Act or not. Since then all abattoirs, with the exception of the numbers mentioned below, have been inspected and the defects and deficiencies brought to the attention of their owners. Some of the larger abattoirs have been inspected on several occasions, e.g. Natal 25; Cape Province 90; Transvaal 60; and Orange Free State 10. The majority of the uninspected abattoirs were of the smaller type situated in remote rural areas.

The certificates of approval issued before 30 June 1970 expired on the 30 June 1973. These had to be renewed. A total of 889 certificates comprising 133 in Natal, 355 in the Cape Province, 328 in the Transvaal and 73 in the Orange Free State, had to be renewed.

By 30 June 1973 a total of 477 had been re-issued, consisting of 84 in Natal, 219 in the Cape Province, 105 in the Transvaal and 69 in the Orange Free State. A total of 412 renewals, consisting of 49 in Natal, 136 in the Cape Province, 223 in the Transvaal and 4 in the Orange Free State, are still outstanding. It is possible that some of these abattoirs have been closed down by the owners without informing the Chief Meat Hygiene Officer.

Sterilisation installations

State Veterinarians are inspectors in terms of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act 36 of 1947).



Natal yellow "tulp" *Homeria glauca*, a source of cardiac glycoside poison

In the Republic of South Africa and South West Africa a total of 180 such installations were registered. State Veterinarians inspected the installations on an annual basis, or more often whenever problems were encountered.

Where such an installation is an integral part of an abattoir, it must also comply with the requirements of the Animal Slaughter, Meat and Animal Products Hygiene Act, 1967 (Act 87 of 1967).

Planning

Plans were submitted, scrutinised and accepted according to the requirements of Act 87 of 1967 and its Regulations in respect of the following abattoirs:

Red meat abattoirs

Plans for suggested improvements dealt with during the year amounted to a total of 23, of which 19 were public and 4 private abattoirs. Plans for a total of 23 new abattoirs were dealt with during the year. This total consists of 9 public and 14 private abattoirs.

Poultry abattoirs

Six plans for new and one for improvement of an existing abattoir were handled during the year.

Rabbit abattoirs

Nine plans for new abattoirs were submitted during the year. The planning of red meat, poultry and rabbit abattoirs in Bantu homelands was dealt with by the Division of Veterinary Services on its own, while the planning of red meat abattoirs for the rest of the Republic was done in conjunction with the Abattoir Commission.

Control services

The Division was responsible for meat inspection at the three private pork export abattoirs, i.e. Eskort Bacon Factory, Estcourt, Natal; Heidelberg, Transvaal; and Spekenam, Bellville, Cape Province, as well as at the following abattoirs under the control of the Abattoir Commission: Pietermaritzburg, Springs, Benoni, Germiston and Wynberg (Sandton). Meat inspection was also done at the game abattoir at Skukuza.

In addition to the above-mentioned service, personnel also exercise control at the following deboning establishments: Impala Union, Otavi, S.W.A.; Siege Meat Industries, Krugersdorp; Brixton Wholesale, Johannesburg; Rand Cold Storage; Springbok Canneries, Germiston; Orchid Foods, Durban; Siege Meat Industries, Cape Town; and the Meat Board, Cape Town; and in the Kruger National Park the Sand River By-Products Unit was also under the control of the Division.

The control of export meat canning factories was done by the S.A.B.S. on behalf of the Division.

Export of meat

Meat was exported to 17 different countries, as well as to the so-called "free ports". During the year the Division received 7 visiting inspectors from overseas.

Import of meat

Meat was imported during the year from Australia (lamb), Botswana, Swaziland and Rhodesia.

Steady progress has been made since the implementation of Act 87 of 1967 with the general improvement of hygiene at abattoirs and deboning plants.

STOCK INSPECTION SERVICES

No serious outbreaks of notifiable diseases necessitated the drafting of additional personnel to infected and threatened areas during the year. More attention could thus be given to the re-organisation of inspectorate areas and the normal routine stock inspection service of the Division.

In view of the importance of an efficient stock inspection service, the increasing number of vacancies caused by retirements and resignations was viewed with alarm. Moreover, the position is aggravated by the small number of recruits drawn into the Service.

ANIMAL HEALTH EXTENSION SERVICE

Extension services were applied in different forms ranging from short courses on animal diseases, lectures delivered at farmers' days, and participating in the activities of study groups to the dissemination of scientific knowledge to individual farmers personally during visits to their farms, at the State Veterinary offices, by telephone or by letter.

IMPORT CONTROL

One of the major functions of the Division of Veterinary Services is to guard against the introduction of animal diseases.

The new quarantine station at Jan Smuts Airport was taken into use in August 1972 and officially opened during October 1972. Quarantine facilities are available for all domestic animals, primates, psittacine and other birds, and rabbits. The importation of animals by air seems to be becoming very popular.

The poultry quarantine station at Irene has been fully occupied since it opened in September 1972.

During the year the animals listed below were imported for slaughter, farming or other purposes:

Cattle	11 761
Sheep	20 521
Goats	9 237
Pigs	109
Horses	144
Dogs	1 315
Cats	375
Poultry	40 454
Turkeys	9 438
Birds	76 678
Primates	414
Tropical fish	1 089 458
Zoo animals	276
Game	16
Reptiles	734
Insects	1 085
Rodents	6

The table below gives an indication of the variety of products imported on permits issued by the Division:

Biltong	11 065 kg
	200 packages
Frozen meat	4 421 625 kg
	68 054 carcases
	68 491 quarters
	4 110 cartons
	592 bales
Poultry carcases	4 040 units
Pancreas	69 654 kg
Horse hearts	16 456 kg
Bull testis	15 450 kg
Sausage casings	665 081 kg
	3 458 tierces
Salami	21 625 kg
Lard	101 150 kg
Tallow	898 cartons
	1 149 drums
Casein	3 073 kg
	2 830 bags
	10 t
Cream	241 359 litres
Butter	40 000 kg
Semen	5 189 ampoules
Fish eggs	1 015 670 units
Hides and skins	2 034 577 kg
	1 463 bales
	750 bundles
	33 cartons
	221 238 units
Wet salted hides	76 465 kg
Hide trimmings	530 t
Karakul pelts	30 027 units
Hair and bristles	61 190 kg
	100 bundles
	316 cartons
	6 cases
Wool	566 756 kg
	5 482 bales
Undyed wooltops	76 bales
Mohair	1 085 kg
Rabbit fur	1 425 kg
Feathers	5 475 kg
	48 bundles
Bone meal	2 837 t
	22 bags
Carcase meal	960 t
Mineral stock feed	23 824 bags
	23 drums
Elephant tusks	143 units
Processed skins and trophies	3 688 units
	522 kg
Second-hand bags	22 469 bales
	20 000 units
Veterinary drugs	117 cartons
	1 case

EXPORT CONTROL

For export purposes, veterinary examination and certification in accordance with the requirements of importing countries were undertaken in respect of the following animals:

Cattle	7 686
Sheep	2 904
Goats	548
Pigs	131
Equines	483
Dogs	1 891
Cats	236
Birds	12 361
Poultry	996 437
Wild animals	166
Laboratory animals	872
Reptiles	161

The products listed below were certified for export:

Frozen and chilled meat	62 682 654 kg
Canned meat	1 439 503 kg
	174 175 cases
Poultry meat	14 916 kg
Venison	10 329 kg
	821 carcases
Bacon	1 273 815 kg
Fish	300 855 kg
Whale meat	6 800 cartons
	200 tins

Whale meat extract	6 080 tins
	1 000 cases
	3 500 bags
Sausage casings	72 301 kg
Eggs	2 160 cases
Semen	15 000 doses
Hides and skins	37 092 838 kg
	237 149 parcels
	85 582 bales
	2 109 drums
	407 809 units
Chinchilla pelts	12 kg
Karakul pelts	1 508 964 units
Horns and hooves	56 009 kg
	429 bundles
	240 bales
Hair and bristles	26 168 kg
	36 cases
	50 bales
	16 cartons
Wool	44 303 838 kg
	123 928 bales
Mohair	2 195 921 kg
Ostrich feathers	36 359 kg
Feathers	871 t
	9 cases
Lamb paunches	6 045 kg
Rennet	75 490 kg
Ox gall	267 t
Glue	70 350 kg
Eggshells	299 kg
Horn and hoof meal	75 690 kg
Blood and carcase meal	62 950 t
	375 bags
Fishmeal	640 420 kg
Whale protein meal	192 153 bags
Molasses meal	12 925 bags
Oil cake meal	840 bags
Lucerne meal	342 t
Poultry feed	6 675 037 kg
	65 057 bags
Stock feed	256 t
	199 455 bags
Bran	9 520 t
Processed skins and trophies	1 392 kg
	24 bales
	5 501 units
Elephant skin	59 478 kg
Ivory	7 614 kg
Grains	2 649 942 t
Beans	92 154 kg
Peas	17 039 kg
Sweet corn	8 983 kg
Lupin seed	200 kg
Potatoes	3 070 t
Onions	844 t
Grapes	9 594 164 kg

TRAINING

At all the agricultural colleges, including the Bantu College at Fort Hare, State Veterinarians were, as in the past, responsible for the veterinary subjects for the diploma course.

The veterinary course for Bantu Assistant Stock Inspectors was conducted by the State Veterinarian, East London.

A short course and seminar on Atomic Absorption Spectrophotometry at Onderstepoort was attended by 2 members of the staff.

Formal in-service training for members of the stock inspectorate staff started during the year. Four courses of four weeks each were attended by the 7 Chief Stock Inspectors and a total of 57 Senior Stock Inspectors and 21 experienced Stock Inspectors. Twenty-three junior members of the inspectorate staff attended the one induction course held during the year.

STOCK CENSUS

Region	Cattle*	Sheep		Goats	Horses	Donkeys and Mules	Pigs	Fowls	Dogs
		Woolled	Non-woolled						
Eastern Cape and Karoo	1 041 869	8 153 119	1 405 516	1 433 257	40 383	14 275	115 974	2 284 478	96 291
Eastern Transvaal	1 047 756	52 757	237 956	553 481	2 973	38 244	59 266	694 543	60 587
Highveld	2 769 213	4 448 877	619 996	196 020	80 480	37 718	264 352	2 895 873	158 269
Natal	2 658 832	1 187 298	232 215	817 217	54 826	84 622	147 407	6 011 777	203 745
Transvaal	2 336 245	1 800 625	387 865	464 737	33 436	41 067	305 832	9 474 298	317 041
Winter Rainfall	349 688	3 131 045	1 120 594	376 066	17 213	8 763	135 451	13 504 398	55 660
O.F.S.	1 270 088	2 486 209	2 957 321	701 892	55 045	49 144	93 968	819 659	49 728
Total	11 474 691	21 259 930	6 961 463	4 542 670	284 356	273 833	1 122 250	23 484 926	941 321

*Please refer to next table for analysis of cattle figures

DISTRIBUTION OF CATTLE

Region	White owners		Non-White owners	
	White areas	Non-White areas	White areas	Non-White areas
Eastern Cape and Karoo	819 371	90	26 291	196 117
Eastern Transvaal	454 665	4 550	30 851	557 690
Highveld	2 470 868	476	172 023	125 846
Natal	1 167 075	278 299	522	1 212 936
Transvaal	1 832 140	8 484	180 609	315 012
Winter Rainfall	347 451	–	2 237	–
O.F.S.	1 107 376	8 066	11 317	143 329
Total	8 198 946	299 965	423 850	2 551 930

Cotyledon Wallichii, Harv.

One of the Cotyledons which contain a heart poison

LEGISLATION

During the year the following Government Notices were published under the Acts indicated.

Animal diseases and Parasites Act (Act 13 of 1956)

(a) G.N. R.1530 dated 1 September 1972 to amend regulations with regard to the movement of wild animals.

(b) G.N. R.1531 dated 1 September 1972 to repeal G.N. 1041 dated 10 July 1964 and G.N. 1772 of 6 November 1964: Foot-and-Mouth Disease areas and restrictions in connection with Foot-and-Mouth Disease.

Animal Slaughter, Meat and Animal Products Hygiene Act (Act 87 of 1967)

(a) G.N. R.1294 dated 28 July, 1972, declaring the rabbit an "animal" for the purposes of the Act.

(b) G.N. R.1529 dated September 1972, granting exemption in respect of certain regulations pertaining to the transportation of meat.

(c) G.N. R.813 dated 18 May 1973, substituting the Second Annexure for the Second Annexure as published in G.N. R.3505 dated 9 October 1969.

TECHNICAL RELATIONS WITH OTHER COUNTRIES

Liaison and co-operation with African Territories

Eight scientists from Angola, Botswana, Mozambique, Swaziland, Uganda and Zambia visited the Institute during the year.

The following vaccines, prepared by the Institute, were supplied to African territories:

Angola	160 450 doses of 2 vaccines
Botswana	193 042 doses of 15 vaccines
Lesotho	94 800 doses of 6 vaccines
Malawi	765 144 doses of 9 vaccines
Mozambique	12 332 doses of 3 vaccines
Rhodesia	3 249 245 doses of 21 vaccines
Swaziland	701 952 doses of 17 vaccines
Zaire	250 doses of 1 vaccine
Zambia	3 104 000 doses of 9 vaccines

Under "Trypanosomiasis" details were given of the joint Rhodesia-Angola-Mozambique-South Africa operations in tsetse fly eradication.

Liaison with overseas countries

Scientific visitors

During the year 42 scientists from 15 countries visited the Institute for varying periods to have discussions and obtain information mainly on diseases peculiar to Africa. One visitor from the United States and one from Australia have remained for longer periods as guest workers at the Institute.

Apart from the above, 213 foreign tourists in organised groups visited the Institute.

Three veterinarians from West Germany, two from the United Kingdom and four from Italy visited the country to inspect the establishments recognised for the export of meat to their countries.

Technical assistance and advice

Bluetongue World Reference Centre (O.I.E.)

During the year a strain of virus isolated from sheep on the island of Cyprus was identified as a type 4.

Various countries have submitted serum samples for the detection of specific antibodies.

The sera from sheep in Madagascar were negative, while a further consignment of 8 sera from India also failed to provide evidence of previous infection. Tests were completed on a set of 98 cattle and sheep sera from Italy. Work continued on the preparation of stock seed antigens for use in countries where bluetongue is not endemic.

World Reference Centre for Horsesickness (O.I.E.)

No samples were received for examination from foreign countries during the year.

Vaccines supplied

The following vaccines were supplied to overseas countries:

Bahrein	40 doses of one vaccine
China (Hong Kong)	200 doses of one vaccine
England	120 doses of tuberculin
Israel	7 500 doses of one vaccine
New Zealand	1 000 doses of one vaccine
St. Helena	1 100 doses of two vaccines

Study tours and official visits

During the period 26 August 1972 to 15 October 1972 Dr J.H. Huyser undertook a study tour to the

United Kingdom, France, Germany, Denmark and the Netherlands. The purpose of the tour was to obtain first-hand knowledge and information regarding the most modern concepts of hygiene in abattoirs and deboning plants, the more recent scientific developments in abattoirs and related industries and to further liaison with officers of the Ministries concerned in order to expedite the solving of problems in connection with the export of meat to the countries concerned.

The Director of Veterinary Services, Dr P.R. Mansvelt, visited Paris during the period 21 to 28 May 1973, for the Annual Meeting of the Office International des Epizooties.

In addition to organising and controlling the annual tsetse fly spraying operation, Dr E.B. Kluge held discussions with representatives from Rhodesia and Mozambique at Pretoria on 7 December 1972 and at Lourenço Marques on 17 April 1973 regarding the control and organisation of the 1973 spraying operations in Mozambique. Dr P.R. Mansvelt also attended both these meetings.

Dr P.R. Mansvelt and Dr E.B. Kluge, with representatives from Botswana and Angola, discussed and planned the operations for 1973 in the Caprivi tsetse fly complex at a meeting in Luanda on 5 April 1973.

During the period 5 March 1973 to 8 March 1973 Dr P.R. Mansvelt, Dr J.P. van der Merwe and Dr P.P. Bosman attended the meetings of the Interterritorial Foot-and-Mouth Advisory Committee and the S.A.R.R.C.U.S. Animal Health Committee in Swaziland.

8. Agricultural Engineering

THE TESTING OF AGRICULTURAL IMPLEMENTS AND EQUIPMENT

The following is a brief review of some of the chief matters regarding agricultural mechanisation and the official testing programme of the Division of Agricultural Engineering:

Test reports on the following series of implements were published during the year under review:

9 *mouldboard ploughs* (Reports Nos. 7215–7223)
6 *milking machines* (Reports Nos. 7301–7306)

Each series of reports was accompanied by an article containing information on the choice, handling and maintenance of the implements concerned.

Winery equipment

Unofficial tests were carried out on a new French winepress at the K.W.V. wineries in Paarl and a report with recommendations was given to the firm. One valuable result of these tests was that engineers had the opportunity of becoming familiar with the machines before they appeared on the South African market.

The testing of the following implements has already been completed and the test reports are being prepared or printed: hammer mills, disc ploughs, chisel ploughs, disc harrows and pick-up hay balers.

Other implements and equipment that have already been tested and for which test programmes are being planned are: grain combine harvesters, farm feed mixers, press-wheel planters for small grain, forage harvesters, mowers, equipment for grain handling, fans for the drying of agricultural products, and sprinklers for irrigation.

Tests for new single-kernel planters which have come on to the market since the previous tests or have not yet been tested, are also being carried out.

The Advisory Committee for the Testing of Agricultural Engineering Equipment (ACTAEE) met three times during the year. The outcome of the Committee's discussions was that recommendations were made which could serve as guidelines. This Committee, on which all interested bodies are represented, is a valuable point of contact between private concerns and official bodies which have a direct or indirect interest in agricultural engineering equipment.

Unofficial tests were also carried out on a container for the overseas air transport of vegetables and fruit and on a new pear pack (telescopic carton with polyethylene lining) – the latter at the request of the Deciduous Fruit Board. Reports on these tests are being prepared.

RESEARCH AND DEVELOPMENT

Apart from the testing programme, the Division is engaged in a wide variety of activities on the mechanisation front. Chief among these are the following:

- *Drying sunflower seed:* Because losses are smaller when sunflowers are harvested wet, the effect of artificial drying on the germination and nutritive value of sunflower seed was investigated in consultation with the Oilseeds Control Board and the Division of Plant and Seed Control.
- *Maize aeration:* The aeration of large quantities of stored maize in grain elevators is being investigated with a view to find an effective means of counteracting injurious heat generation.
- *Mechanisation systems for maize cultivation:* Interest in big tractors and wide implements is increasing rapidly, and the Division is investigating this development.
- *Bulk handling of small grain:* A study of the ways in which small grain is delivered to co-operatives in the winter rainfall area was carried out and a report prepared.
- *A survey of winery equipment* was conducted and a report (No. 13/73) has already appeared.
- *The performance of auger conveyors* with regard to auger speed and gradient was investigated with a view to use in wineries, and performance curves were drawn.
- A survey of *mechanisation practices in the fruit industry* was carried out in the Winter Rainfall Region and an interim report was prepared.
- A survey of the *bigger fruit packing houses* in the Stellenbosch–Grabouw area was carried out and a report is available.
- *Design for a co-operative drying installation:* Citrusdal Koöperatiewe Droogbane is planning unusual drying installations which will cost about

R270 000 to construct, and the staff of the Division are playing a leading part in the planning and designing of these installations. A great deal has already been done in the way of preliminary investigations in this regard.

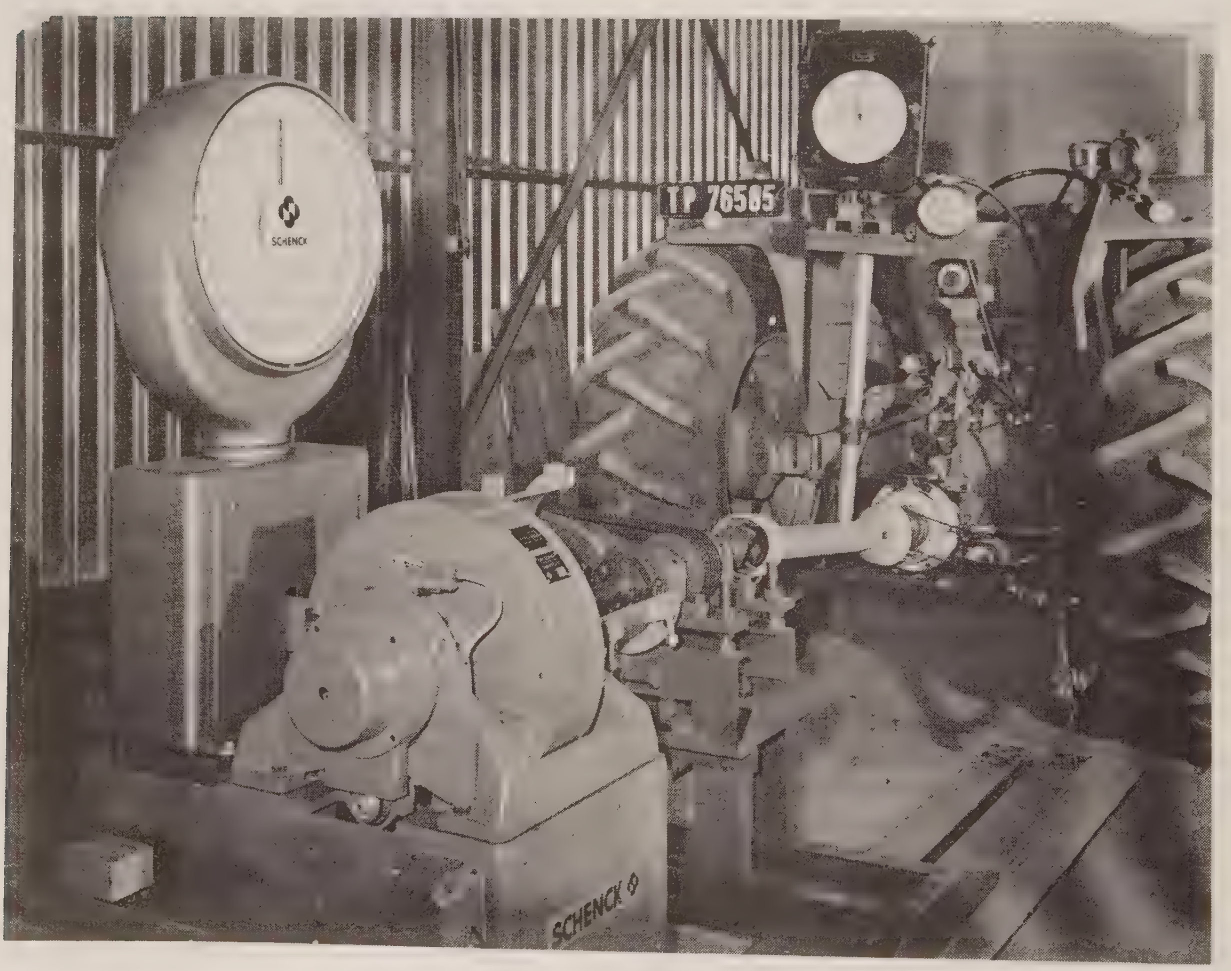
- *Pre-cooling of table grapes* in the production areas was investigated and the findings were summarised in a report.
- *The efficiency of dehydration tunnels* for small farmers is being tested in co-operation with the Fruit and Fruit Technology Research Institute. An interim report has been published.
- *Training systems for table grapes* are being investigated with a view to saving on erection expenses, which are high at present.
- *The cooling of grape stores* is also receiving attention.

SOIL CONSERVATION WORKS

Big concrete weirs for the stabilisation of badly eroded water courses are needed. The designing and construction of these soil conservation works went ahead without any delays in the Orange River catchment and good progress was made, as the following tables show:

Activities of the design section

Type of work	Number
Site surveys	9
Weir designs	13
Foundation inspections in detail	13



The measurement of power requirements in machinery forms an important part of the Agricultural Engineering Division's testing programme. For this purpose sophisticated apparatus is used. This photograph shows a current dynamometer being used to calibrate a torque meter. The torque meter is mounted on the power shaft of a tractor and is used to determine the power requirements of various agricultural implements

Works under construction and completed

Year	Under construction		Completed	
	Number	Value (R)	Number	Value (R)
1972/73	9	301 830	13	765 759
1971/72	9	388 191	9	401 071

Repair works under construction and completed

Year	Under construction		Completed	
	Number	Value (R)	Number	Value (R)
1972/73	4	5 100	17	149 317
1971/72	2	47 300	9	115 979

SOIL CONSERVATION RESEARCH

Data on rainfall intensities in the Winter Rainfall Region were collected and processed. According to a report, significant deviations from the accepted values came to light.

The main aim of soil conservation research at Aliwal North is to develop better techniques of erosion control. Activities were aimed at carrying out four research projects. Seven out of 17 pilot experiments were completed.

By applying simple techniques to accelerate the build-up of sediment above soil conservation works, it was demonstrated that the sediment slope continues to build up even after 20 years. The sediment build-up above a soil conservation work in the Elands River is cited as an example:

Sediment above the soil conservation work in the Elands River

Year surveyed	Distance (m) (above work)	Height (m) (above spill-way)	Sediment slope
1953	314	2,4	0,007 7
1957	323	2,9	0,009 1
1962	345	3,2	0,009 3
1966	408	5,4	0,013 3
1969	423	6,2	0,014 7
1973	451	7,7	0,017 0

The Agricultural Engineering Division's official programme for the testing of hammer mills was completed during the year under review

PLANNING OF RUN-OFF CONTROL

The systematic planning of catchment areas to control run-off was extended by the regional engineers to include other vulnerable catchment areas besides the Upper Orange priority area.

Progress in these areas was as follows:

Highveld Region

In the Upper Orange catchment area the Grootspruit subcatchment was virtually completed. In the Vaal Dam catchment area two planning operations were completed. The planning phase at Opkoms was completed. A subcatchment of the Vet River and a subcatchment in the Klerkspruit catchment area were planned.

Free State Region

The run-off control planning for Slykspruit (100 000 ha) was completed, and the planning of the Montagu Dam catchment area at Zastron was started.

Eastern Cape Region

Two catchment areas, viz Waschbankspruit, and Teefontein and Oslaagte, were planned.

Karoo Region

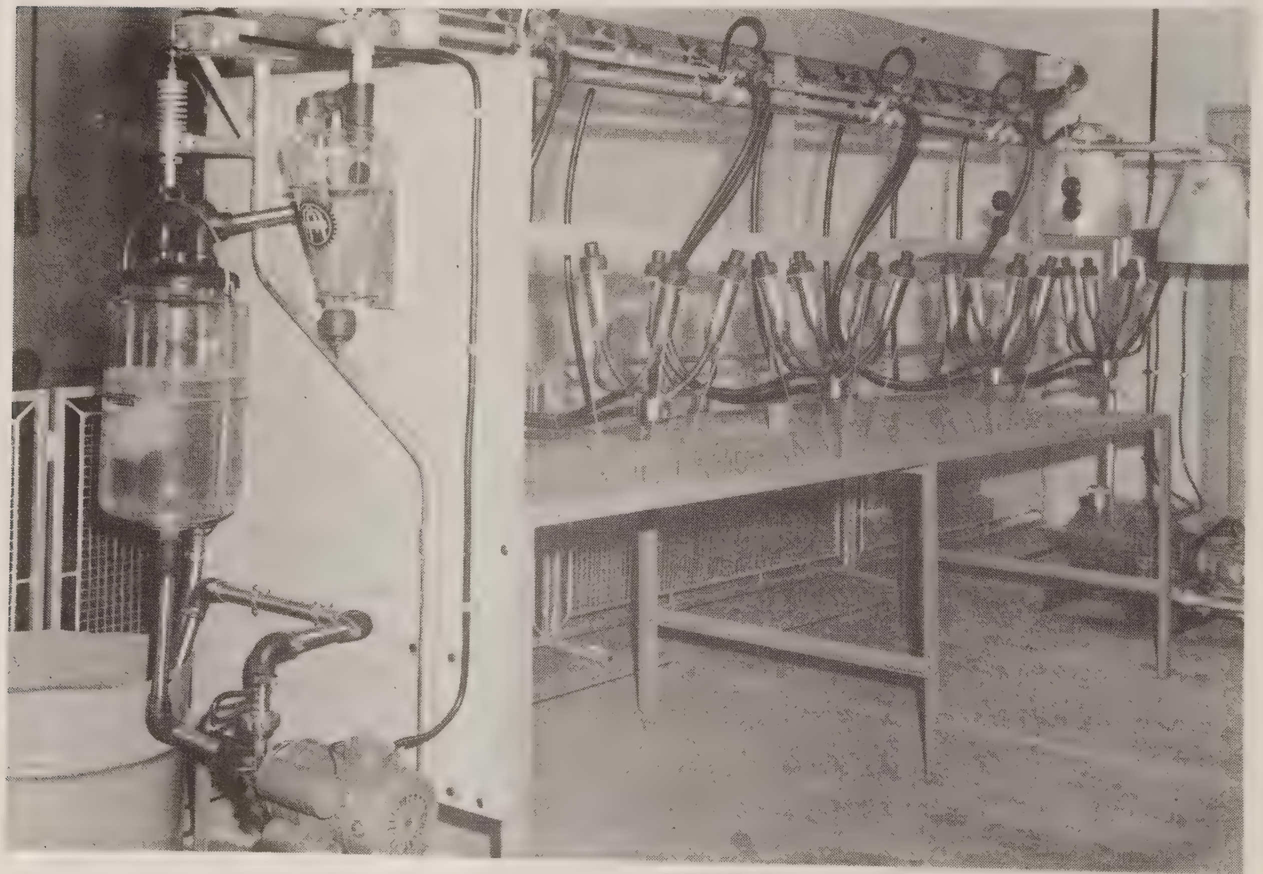
The planning of three subcatchments in the Orange River catchment, about 125 000 ha in extent, was completed.

WATER UTILISATION

The design, planning and construction of Government irrigation schemes

The Makatini Pilot Development Project

The planning of irrigation farming in this area in Northern Natal required a great deal of attention. Contour maps for 1 200 ha, scales 1 : 2 000 and 1 : 5 000, were completed. Four farms were planned in detail and farm boundaries, fields and farm roads were staked out on the site.



One of the five test benches used during the official testing programme for milking machines. These machines were tested for a period of 4 400 hours, equivalent to a working period of three years. The test reports on the five different makes were published in January 1973

A mouldboard plough being tested. Test reports on eight different mouldboard ploughs also contain information about the choice, adjustment and general working of the implements

The Akademos Farmers' Study Group from the Western Transvaal was one of numerous parties who visited the Division of Agricultural Engineering at Silverton, Pretoria, during the year under review

Van der Kloof Irrigation Scheme

The area priority investigations having been completed during the previous year, a development programme and estimates of expenditure for the next seven years were drawn up during the year under review.

For planning purposes the financial implications of various levels of development were considered from the point of view of staffing, estimates of expenditure and the facilities that will have to be provided.

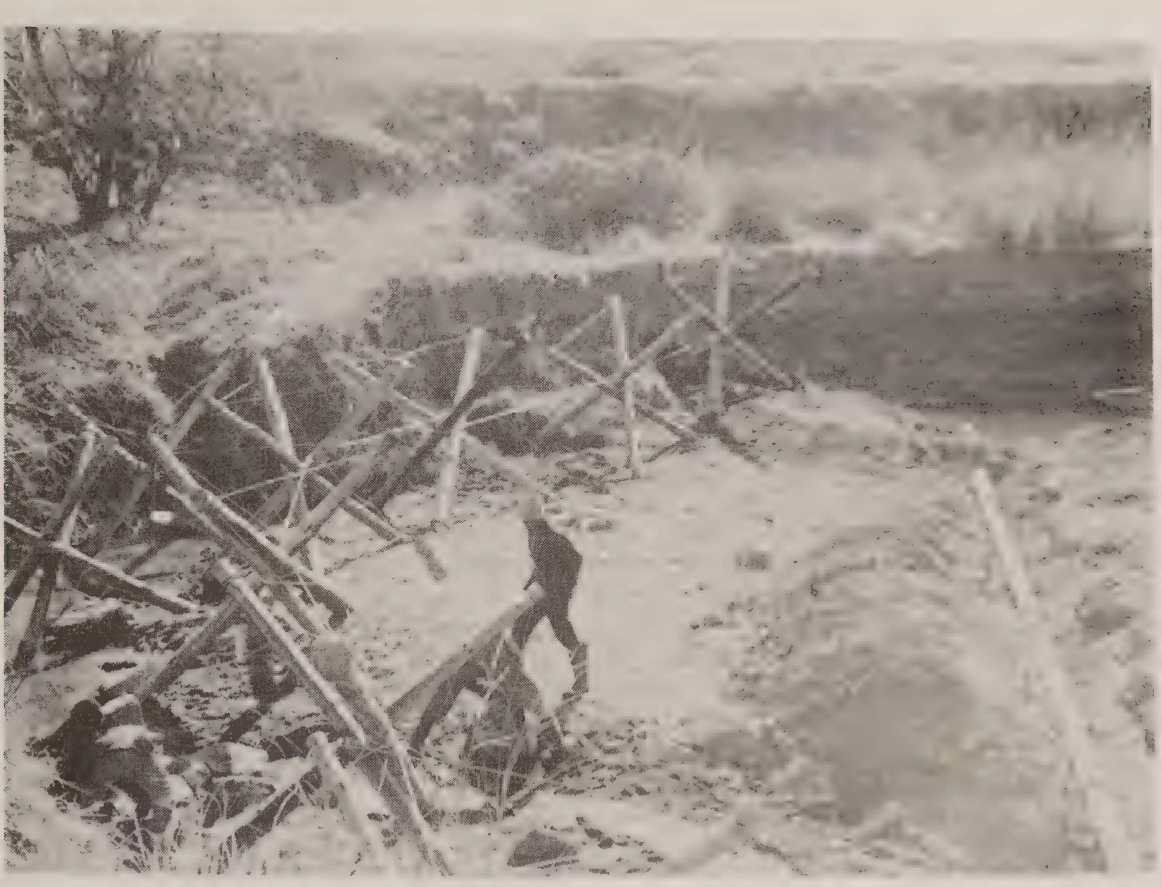
Research and development

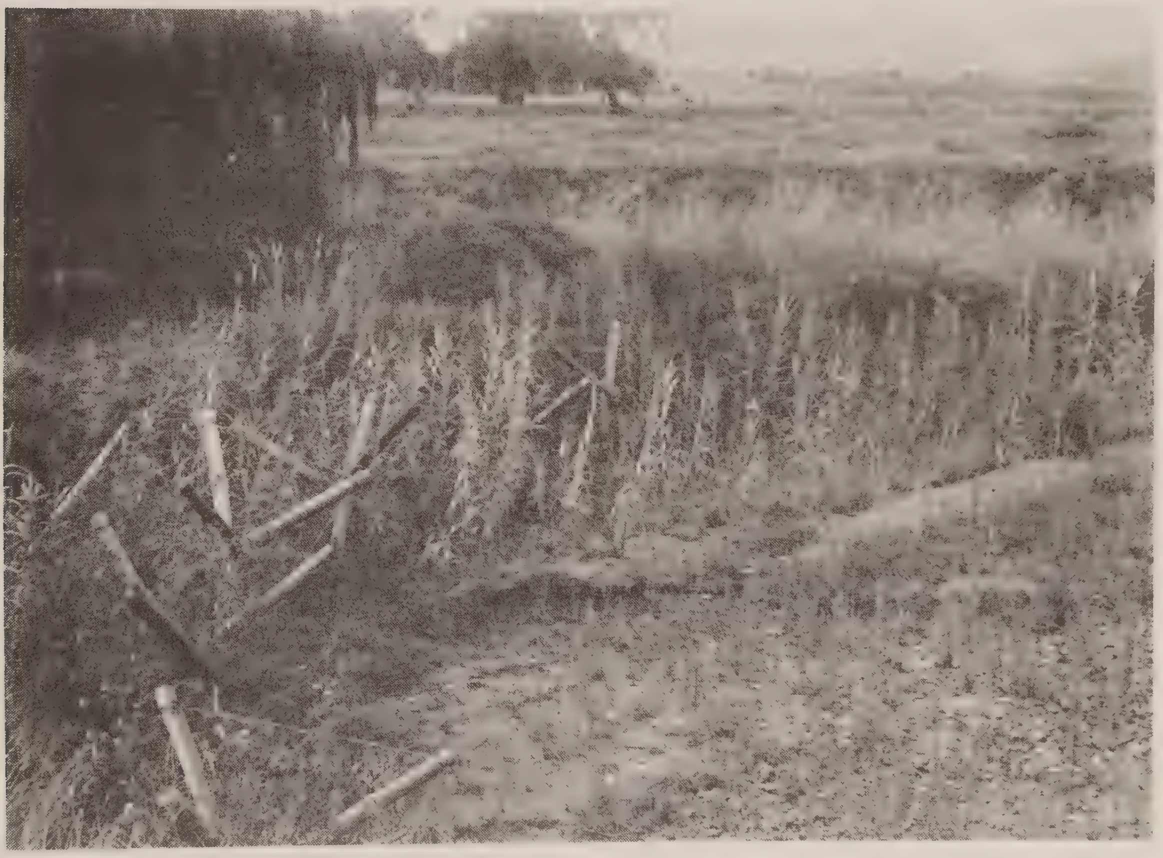
- The theoretical design formula for flood irrigation beds was further refined during the year under review, taking into account not only the bed dimensions and irrigation flow but also the gradient. A table of stream cut-off coëfficients was compiled with the aid of a computer program.
- At Vaalharts field surveyes of bed irrigation systems were started in order to evaluate these systems.
- Attention was given to the application of the flood irrigation formula to the design of pre-irrigation systems.
- A drip irrigation system was installed on the Division's premises at Silverton and observations of the evenness of spread and irrigation scheduling were carried out.
- The development of a flow regulation valve in order to ensure an even flow was investigated.
- Infiltration measurements were carried out at the Makatini Pilot Development Project and Experimental Farm in order to obtain data in connection with the infiltration capacity of the various soil types in the project area.
- An automatic recording method was developed to speed up and facilitate infiltration measurements.

The testing of irrigation equipment

The pumps and pipeline systems in the hydraulics laboratory were installed. Tests on irrigation equipment

The Grootfontein basin plough with planter and fertilizer bin. The plough is used to increase the water-holding capacity of exposed, hard soil, thus promoting the establishment of vegetation





(a) & (b) These two photographs illustrate how rapid erosion on sharp bends in ditches can be checked by using jacks. The photographs were taken in the Lady Grey district. On the photograph above, the jacks are dug in and anchored on a sharp bend. The other photograph shows silting up and establishment of vegetation 9 months later and the development of flood irrigation equipment will be among the projects to be carried out in this laboratory. All the other necessary preparatory work for the testing of sprinklers was completed.

FARM BUILDINGS

More and more interest is being shown in the activities of the Farm Building Section, particularly in the recommendations to farmers which have resulted from this Section's work. The number of requests for the planning of intensive stock farming systems on farms has also increased considerably.

Waste management in larger stock-farming systems has gained a great deal of prominence and it was necessary to institute a thorough investigation. On the instructions of the interdepartmental committee of inquiry into problems connected with the disposal of waste matter in stock feeding systems, two comprehensive reports with the following titles were written:

1. Review of the literature on overseas conditions and developments with regard to stock waste management.
2. Stock-feeding systems and the accompanying pollution in South Africa.

This work was followed by 27 visits to farmers, in the course of which waste management systems and possible management problems were investigated. The report emphasises the fact that, as yet, little value is attached to animal waste as an agricultural fertiliser and that the pollution of public streams does occur.

Most of the enquiries received concerned pig housing. The completion of the prototype farrowing pens at the Animal and Dairy Science Research Institute at Irene elicited great interest. In this building the sows stand in crates made of tubing during the suckling period of 6 weeks.

Observations confirm that:

- farmers can reduce the overlying of piglets drastically by the method;
- that the design of the farrowing pen can be extremely important and that it may be regarded as the most important aspect of the whole enterprise; and
- that the use of concrete flooring in the pens warrants further research.

For animals housed in indoor systems where movement is restricted pleasant environmental conditions are a prerequisite for success. While the sows and their farrows were in the farrowing pen at Irene extensive readings of temperature, wind conditions, radiation, etc., were taken in and around the pen to determine the cryptoclimate in the pen during a period of 24 hours. The results have not yet been fully processed, but there are already indications that the light-weight prefabricated building can offer an acceptable interior climate during typical winter conditions, provided flaps are put in the side opening to restrict ventilation.

PROFESSIONAL TECHNICAL SERVICES

Services in various fields were rendered to other Departmental and Government bodies, as well as to semi-Government bodies. The most important were the following:

Bulk storage of grain

The bulk handling and storage of grain are for the most part taken care of by co-operatives in consultation with the Department of Agricultural Economics and Marketing. Senior engineers of the Division of Agricultural Engineering actively assisted the advisory committee concerned by giving technical advice and supervising the planning and construction of silos. The grain elevator scheme is aimed at eventually making it possible to store the country's entire grain crop in elevators.

Glasshouses and growth cabinets

During the past financial year tenders for the growth cabinets ordered for various bodies were awarded to a South African firm. Apart from an earlier small growth cabinet, these four cabinets are the first big ones to be manufactured in South Africa.

Implements and equipment for Departmental institutions

The knowledge and experience gained in the course of testing programmes have been of great value in purchasing implements and equipment for research stations and other Departmental bodies. Departments such as the Department of Bantu Administration and Development and the Department of Prisons, as well as agricultural high schools, are increasingly making use of these services.

Experimental farm development and research

The services rendered by the Division in this connection are not only undertaken by Regional engineering staff; the various sections of the Head Office of the Division as Mechanisation, Irrigation and Farm Buildings Sections, are also involved. One of the main tasks in this regard is the planning, designing and construction of buildings for research stations. The designing and manufacture of special research apparatus and implements are steadily increasing.

Training at colleges of agriculture

The increasing importance of mechanisation, farm building planning and irrigation in the agricultural industry is making higher and higher demands on the Division with regard to the training of diploma students at colleges of agriculture. Statistics from the Elsenburg College of Agriculture serve to illustrate the situation in this regard. A total of 219 lectures (of 40 minutes each) and 488 practical classes (of 120 minutes each) were given to students at that College during the year.

EXTENSION AND LIAISON

Besides replying to written and telephone enquiries, the staff of the Division concentrated on group extension by means of short courses, organised group visits to the Division, lectures on farmers' days or to study groups, students and officers, exhibitions at agricultural shows, and radio talks.

A wide area of the agricultural engineering field was covered in this way. The available test reports and other publications were also used in the Division's extension efforts.

9. Additional Services

PLANT STUDIES

The Pretoria National Botanic Garden

The five-year plan for the basic layout of the garden is now in its third year. During the year under review the programme for the development of the garden centred on the development of the surroundings of the new building for the Institute, which was completed during the year.

For several years planning has been based on the development of broad plant communities, both ecological and aesthetic factors being taken into account. These plant communities are planned in such a way that the building and garden will form an integral whole as far as possible.

The macchia communities, which have already undergone a certain amount of senescence, are being thinned out and replanted. A Lowveld group will be created on the north side of the ridge. Detailed planning of this group, which will indicate finer details such as the siting of individuals of select species, represents a new departure in planning policy.

A little over 600 different collections, and 9 800 individual plants from the nursery were pricked out in the garden.

The nursery

The facilities in the nursery were further improved by re-wiring and the provision of underfloor heating in two existing glasshouses, and a third new glasshouse was taken into use.

During the year the nursery gained 70 collections. The total number of species in the nursery is now 3 508, the total number of collections about 4 600 and the number of plants 26 000.

Special study collections, viz those of the families Lamiaceae and Ebenaceae and the genus *Mariscus*, are maintained. Publications on *Gladiolus, Crinum* and *Zantedeschia*, of which live study collections had been built up, appeared during the year. These beautiful works give an excellent picture of the value of the nurseries to the researchers of the Institute.

Botanical Surveys

A global survey of the general conservation status of South African veld types was prepared and will be published soon. High priority areas for conservation being mentioned are the Richtersveld in the North-western Cape and Tongaland in North-east Natal.

Braun-Blanquet method

The valley of the Upper Orange River from the South African/Lesotho border down to the Orange-Vaal confluence has been surveyed, using the Braun-Blanquet method. The method proved to be efficient both in respect of effort expended and results obtained.

A considerable number of associations and other syntaxa were described. Based on the results of this Upper Orange River survey and several smaller surveys in other parts of the country, in which the Braun-Blanquet method was also used, it is concluded that this method leads to good results at a detailed and semi-detailed scale in regard to classification of the various types of vegetation in South Africa.

Highveld

The Lichtenburg and Maquassi key areas which have been surveyed, will be the basis for extrapolation into the Western Transvaal region. The Ecological Profiles technique was applied to quadrat-data from Lichtenburg and other French synthesis methods are to be used on the same data matrices.

Veld Types

The Veld types of South Africa which has become a standard work in South African botanical literature is being reprinted with updated names. At the same time the work is being thoroughly revised and sections of this work are to be published in the Memoirs of the Botanical Survey of South Africa series.

Upper Orange Catchment

In the course of a study on the relation between plants and their environment, data that could be useful in pasture management in this vital area are being collected. At the same time standards for determining grazing potential are being sought.

The Botanical Research Institute is continuously gathering information regarding some 1 000 indigenous South African trees and publishes this information. The collection of photographs of these varieties is made as comprehensive as possible. This photograph shows the flowering manner and leaves of *Pavetta edentula,* an indigenous tree.

Jack Scott Nature Reserve

A phytosociological study of the Reserve, situated in Acocks's Bankenveld near Krugersdorp, has recently been completed. Normal association analysis was used to classify quadrats. Species were classified following the Braun-Blanquet Method and association analysis and groups were re-arranged according to their affinities, as determined by the Braun-Blanquet approach.

In this way recognisable species combinations for stands that are typical of classes were found.

Northern Transvaal Bushveld

A project aimed at producing a reconnaissance map of the Northern and North-Western Transvaal Bushveld at a 1: 500 000 scale has been started. A survey of the Rietvallei area near Rustenburg has served as a pilot project for this scheme.

Eastern Orange Free State

A survey carried out in the South-Eastern Orange Free State districts of Ficksburg and Clocolan is being written up. It is in the nature of a technique study, assessing the applicability of colour aerial photographs to vegetation analysis in a predominantly grassland area and comparing them with black and white and monochrome prints of differing scales.

Earth Resources Technology Satellite
"ERTS – 1"

Together with the C.S.I.R. the Institute has been playing a major role in advising various State

Departments as well as the private sector on applications of recent American space satellite imagery. The use of photography from the ERTS-1 satellite has been evaluated for ecological survey and land use work.

Positive identification of a number of ecological features, veld and vegetation types has been achieved. These include Karoo vegetation and the invading boundary of False Karoo vegetation into grassland, forest, scrub, grassveld and bushveld, as well as the time and occurrence of fire in relation to various kinds of veld.

The location and extent of heavily overgrazed grassveld areas can be broadly ascertained from the satellite imagery and are frequently clearly related to demographic patterns.

Fynbos vegetation

A vegetation survey of the Cape of Good Hope Nature Reserve will go to press soon. It will include a comprehensive check-list of plants.

A project on the vegetation of the Cape Hangklip area was completed.

Growth and phenological measurements of *Orothamus zeyheri* are continuing for the study of the regenerative capacity of this very rare and endangered species.

Systematic botany

Flora of Southern Africa

Six volumes of the Flora are in the course of preparation.

Vol. 9: In this volume Myricaceae has been completed and a considerable amount of work has been done on Proteaceae.

Vol. 14: Crassula has almost been completed.

Vol. 16: Mimosoideae are practically finished and good progress has been made with the Ceasalpinioideae.

Vol. 21: The only two outstanding taxa in this volume are Hermannia (Sterculiaceae) and Malvaceae. In Hermannia about 80 species have been completed. Malvaceae is nearing completion.

Vol. 22: Elatinaceae, Frankeniaceae, Tamaricaceae and Violaceae have been completed and Cactaceae and Turneraceae are being revised. Begoniaceae are almost complete and Passifloraceae are being prepared. Finishing touches are being put to Flacourtiaceae, Achariaceae and Guttiferae.

Vol. 25: The minor genera of Ericaceae are being worked on.

Genera of Southern African Flowering Plants

The first volume dealing with the dicotyledons has been completed and is in the press. The monocotyledons are being worked on. The Genera will form part of the Flora of Southern Africa series.

Flowering Plants of Africa

This work appears regularly and to date 1 668 plates have been published. The printing is now done by the Government Printer.

Flora of Natal

This flora has been published as *Mem. Bot. Surv. S. Afr.* No. 39, 1973. It deals with the 4 818 species of flowering plants and ferns known from this province and includes keys to families and genera.

Gladiolus species in South Africa

Important contributions were made to the work "A revision of the South African species of Gladilus". It deals with 103 species of this horticulturally important genus and contains 32 illustrations in full colour, 51 half-tone plates and 30 black and white figures.

Bothalia

Volume 11, parts 1 and 2, which runs into 205 pages was published for the first time in A4 format and with a new cover designed by artists of the Department. The main taxonomic works are revisions of the genera *Zantedeschia, Crinum* and *Commiphora.* The remaining articles deal with a variety of subjects including ecology, economic botany, mycology and phytogeography.

The morphology of Bauhinia

A morphological and anatomical investigation of the Soutern African members of *Bauhinia* and a number of related genera revealed that these groups have a district identity as separate genera, from the point of view of their anatomy as well.

Hypoxidaceae

An anatomical and cytological study of this family brought to light two new taxa and gave new insight into relationships within the family.

Mother-in-law's tongue *Sansevieria* is prepared as a food. Survival studies, conducted at the request of the Defence Force, have shown that it is possible to survive on food and water obtained from wild plants and animals

The morphology and anatomy of Ochna

A morphological and anatomical examination is at present being made of the twelve or 30 species of this genus found in Southern Africa. Anatomical data already indicate that two groups can clearly be distinguished within the genus.

Anatomy of grasses

1 500 specimens, representing some 500 of the approximately 1 000 species of South African grasses have been sectioned and photographed. In addition 700 epidermal scrapes have been prepared. Altogether 832 anatomical and morphological characters were chosen for use in computer-generated keys, tables and taxonomic descriptions.

Liaison Officer, Kew, England

The genera *Acacia, Albizia, Elephantorrhiza, Newtonia* and *Xylia* were written up, thus completing the account of the Mimosoideae for the Flora of Southern Africa.

A start was made on the account of Caesalpinioideae for the Flora of Southern Africa. The genera *Afzelia, Baikiaea, Burkea, Colophospermum, Cordyla, Dialium, Erythrophleum, Guibourtia, Peltophorum, Swartzia, Tamarindus* and *Umtiza* were written up. Nine papers were published during the year.

During an Open Day at the Royal Botanic Gardens an exhibition was staged on *Welwitschia* to commemorate the centenary of the death of the Austrian botanist Friedrich Welwitsch.

Numerous reports were written on problems relating to the identification and classification of South African plants.

Herbarium Development

New herbarium cabinets

In the new building of the Institute the herbarium is housed in four halls, each measuring about 30 m x 15 m. The total of 260 new herbarium cabinets have been installed, 65 in each hall.

Computerisation

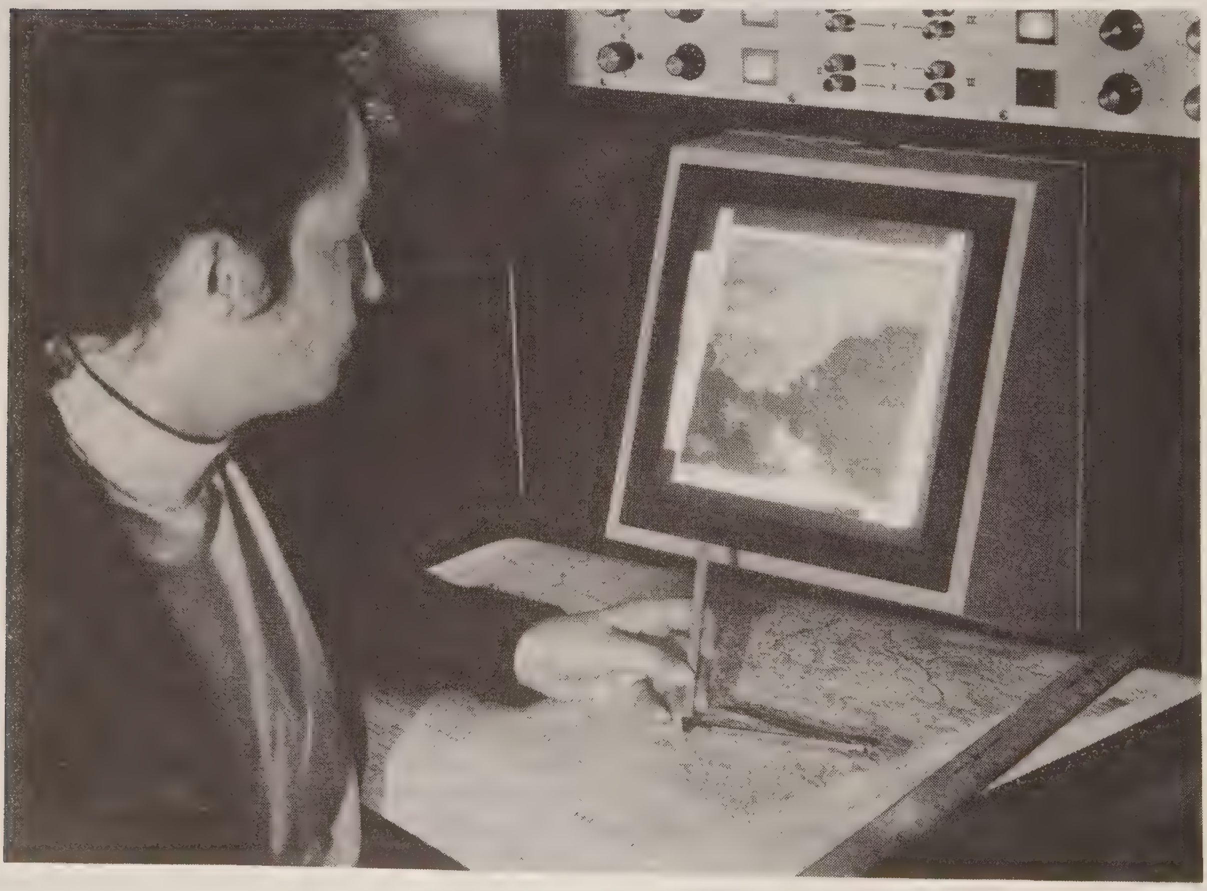
During 1974 the new computer of the Department will become operative and the Institute will be provided with four terminals. Preparations are being made to build up a computerised data bank. The first steps are to gather data provided by the estimated 600 000 herbarium specimens from Southern Africa in the National Herbarium in Pretoria. The aim is to record all useful information provided on labels and to give an indication of the state of each specimen.

Quick guides

Officers in the section devote most of their working time to the identification of plants. It is therefore important to rationalise this activity as far as possible. In order to reduce the handling of samples, quick guides were compiled with each species or infraspecific taxon represented by only one or two specimens. These specimens, which have been compared with authentic material as far as possible, are sealed in plastic bags.

Pretoria Flora

This work deals with about 1 800 species of ferns and flowering plants found in the Pretoria district. It



Photographs received from the satellite ERTS 1 are interpreted with the aid of a multi-spectral viewer. Ecological boundaries can be plotted and vegetation changes monitored by means of these ERTS photographs

contains descriptive keys to families, genera and species. Opposite the part of the key where a particular species is keyed out there is a line-drawing of the species showing the distinguishing characteristics.

The descriptive part of this work has already largely been completed.

List of South African plant names

About 90 per cent of the plant names currently used in the herbarium have been put on cards and are being prepared for sorting and print-out by computer.

South African key grasses

The Institute is preparing a work on about 90 South African grasses. It will provide the scientific name with recent synonyms and one or more common names. A short description consisting mainly of diagnostic features is followed by detailed notes on ecology and distribution. Each species is depicted on two or three photographs showing habit, inflorescence and special characteristics.

A distribution map is provided with each species.

Economic Botany

Cancer research

The Institute is participating in a world-wide programme for testing plants for cancerocidal and other medicinal properties. A large number of samples have already been collected in the Republic and South-West Africa and sent to the U.S.A. for testing. A few species have yielded very promising results.

Poisonous plants

Good progress is being made with a book on South African poisonous plants. About 70 important plants are dealt with. Colour photographs of all the plants have been taken and the botanical descriptions are virtually complete. It is hoped to have the manuscript ready for the press by the end of the year.

Investigations into the causes of unfamiliar cases of poisoning among stock were undertaken in co-operation with the Division of Toxicology at Onderstepoort. Excellent progress was made with research on cerebral badesiosis in the North-Western Transvaal, and the discoloration of sheep and beef carcasses in the Eastern Cape Province is still being closely investigated.

Survival studies

Research and activities in connection with survival in the veld are continuing to expand. Lectures are being prepared and practical survival exercises were undertaken in co-operation units of the South African Defence Force.

Survey of Opuntia species in South Africa

Work on this project is continuing in collaboration with the Plant Protection Research Institute.

Nassella trichotoma or "Nasella tussock", an unpalatable veld weed of Argentinian origin, is causing concern in the Somerset East, Barkly East and Hogsback areas. During a recent survey, undertaken with the aid of a helicopter, new infestation localities were spotted.

Identification and Information Service

Many thousands of plant specimens were named and mounted by the staff of the Institute in Pretoria and by the various laboratories of the Institute at Durban, Grahamstown and Stellenbosch. Thousands of enquiries were dealt with by letter, telephone or in the course of interviews.

SEED CONTROL

Breeding

Inclusion of new cultivars in the Variety List

The following table shows the kinds of plants, and the number of cultivars of each kind, for which applications for inclusion in the Variety List were received:

Crop	Number of cultivars			
	Bred locally		Bred abroad	Total
	Official	Private		
Maize	—	30	—	30
Grain sorghum	—	4	8	12
Soya-beans	—	2	—	2
Cotton	8	—	—	8
Sweetcorn	—	—	3	3
Castor oil	—	4	—	4
Dwarf beans	—	—	1	1
Tomatoes	—	4	2	6
Cabbage	—	—	1	1
Onions	—	4	1	1
Cucumbers	—	—	1	1
Carrots	—	—	1	1
Gem squashes	—	—	1	1
Muskmelons	—	—	2	2
Total 1972/73	8	44	21	73

In comparison with previous years, there were more applications in respect of vegetables among the applications for the registration of new cultivars.

The following numbers of cultivars were included in the Variety List:

Kind	Number included in Variety List
Maize	30
Grain sorghum	21
Cotton	3
Cabbage	3
Tomatoes	1
Cucumbers	2
Total 1972/73	60

In order to establish the agricultural value of maize, grain sorghum, cotton and soya-bean cultivars, 96 cultivar trials were carried out at different places in the Republic.

On 11 August 1972, 253 cultivar names were deleted from the Variety List.

Cultivar trueness

In all, 5 186 seed samples of 54 kinds were tested to determine cultivar trueness and purity. The chief kinds of vegetables tested were maize (1 061 samples), potatoes (530 samples), tomatoes (303 samples), grain sorghum (264 samples), cabbage (230 samples), peas (217 samples), and onions (208 samples).

Scheme for testing variety trueness and purity

A scheme for testing variety trueness and purity was instituted in order to assist importers of seed who lack the necessary facilities for testing; the scheme was announced in the *Government Gazette* of 8 September 1972.

For the time being this service will apply only to tomatoes, cauliflower and cabbage.

Plant Breeders' Rights

The Plant Breeders' Rights Act (Act 22 of 1964), as amended, lays down that any person who has an interest in a new plant that had its origin in the Republic can protect his rights in respect of such plant in terms of the Act.

In all, 18 applications for provisional plant breeders' rights in respect of eight crops were received (wheat – 6, tomatoes – 3, hops – 3, lupins – 2, lucerne – 1, maize – 1, gem squashes – 1, and sunflowers – 1).

Seven applications were received last year.

Applications for final plant breeders' rights were received for 1 kind of plum and 2 peaches.

Provisional plant breeders' rights have been granted in respect of 1 grape variety, a dwarf bean, 3 soya-beans, 2 peaches, and 1 plum.

Final plant breeders' rights have been granted in respect of a dwarf bean.

Basic Seed

Production and certification of basic seed

Maize – The following table shows the mass (kg) of certified basic seed for the various groups:

Group	Departmental	Private	Total
Open-pollinated varieties	339 317	27 750	367 067
Inbred strains	57 943	–	75 943
Single crossings	59 047	36 315	95 362
Total 1972/73	456 307	64 065	520 372

Including the quantity of basic seed carried over, an adequate amount is available for the following planting season.

Other kinds

The following quantities of basic seed of the kinds and varieties listed below were produced:

Kind	Variety	Mass (kg)
Cabbage	Cape Spitz	97
Lucerne	Karoo 70	148
Pumpkin	Flat White Boer (A)	150
Radish	Nooitgedacht	270
Onions	Australian Brown	120
	Caledon Globe	68
	De Wildt	30
Lupins	Kubesa	60 300

Plant Introduction

The following table shows the number of samples imported and exported by the Plant Introduction Section:

Number	1972/73
Samples exported	1 222
Samples imported for local researchers	1 143
Samples imported for experimental gardens	5 472
Total	7 837

The number of samples exported increased by 28 per cent in comparison with the previous year.

Propagation material was imported from 36 countries and exported to 44 countries.

Germ plasm

The maintenance of germ plasm in the form of seed in cool, dry storage or vegetative material in nurseries ensures that valuable genes are preserved for future use.

375 seed samples were placed in the germ plasm bank.

Domestic Seed Services

Control over the seed trade

The total number of inspections carried out on the premises of seed merchants and cleaners was 2 411, which is 13 per cent more than in the previous year.

Further intensification of effective inspections and better co-operation on the part of the seed trade resulted in noteworthy improvements as regards standards. It is also clear that the seed trade is now becoming better oriented to the provisions of the Seeds Act and is therefore more successful in complying with the requirements.

The total number of registered sellers and cleaners of seed is 403 (as against 410 last year); 341 are registered as sellers and 62 as cleaners.

The registered sellers and cleaners of seed are distributed over the four provinces as follows:

	Transvaal	Cape	Natal	O.F.S.	Total
Sellers	129	116	65	31	341
Cleaners	30	13	10	9	62
Total	159	129	75	40	403

To exercise control over the sale and cleaning of seed, 2 411 inspection visits were paid to sellers and cleaners of seed in the various provinces.

1 159 samples were taken in order to check whether seed being sold complied with the requirements with regard to germination, purity and weed seed content.

Sealing of lucerne seed

The following quantities of lucerne seed were approved and sealed:

Place where approved	Mass of seed 1972/73
Oudtshoorn/Ladismith	1 072 750
Upington	74 164
Johannesburg	80 800
Total	1 227 714

Imported seed that did not come up to the required variety standards of trueness to type

Of a total of 1 019 samples of imported seed tested for variety trueness, 51 (representatives of 6 047 kg of seed) showed serious, and 67 (representative of 26 818 kg of seed) less serious defects.

Analysis, testing and examination of seed

The Division performs important services in connection with control over the seed trade, testing, analysis and examination of seed samples for purity, germination, moisture content, weed content and other properties relating to seed quality.

The following table shows the number of samples submitted to the Division by seed merchants and other members of the public in terms of the Seeds Act and Seed Certification Scheme, or for purposes of research:

Kind	Under the Certification Scheme (including basic seed)	By the public	Under the Seeds Act			For research purposes	Total
			From the seed trade	Exported seed	Imported seed		
Field crops							
Total 1972/73	5 796	2 460	1 406	537	434	680	11 313
Horticulture							
Total 1972/73	1 056	2 688	383	10	1 295	163	5 595

Prosecutions

150 prosecutions were instituted for offences under the Seeds Act.

Control over imported seed

The following table shows the mass and percentage of imported seed rejected:

Reasons for rejection	Mass (kg) rejected	Mass rejected as % of total mass imported
Germination too low	15 946	0,50
Purity too low	130 200	4,20
Weed content too high	13 922	0,44
Total	160 068	5,14

Investigations into seed testing problems

Investigations led to the introduction of better testing techniques for beetroot and cabbage. An optimal germination method for the thistle *Silybum marianum* was developed on behalf of a research institution. Chlorotic spot on the cotyledons of gem squashes does not affect the yield, unless more than half the cotyledons are affected.

Field inspection service

The following schemes aimed at the production of high-quality seed are administered and applied as part of the field inspection service:

(a) the *Basic Seed Scheme*, in terms of which basic seed for the production of certified seed under the Seed Certification Scheme and the O.E.C.D. schemes is produced:

(b) the *Seed Certification Scheme*, in terms of which variety-pure and variety-true seed of known pedigree is produced;

(c) the *Export Seed Scheme*, in terms of which solely basic seed, obtained from foreign seed firms is multiplied under official supervision in the Republic;

(d) the *O.E.C.D. Scheme for Forage Crop Seed.*

The following table shows the mass (in kg) of seed that met the requirements of these schemes:

Vaalharts Irrigation Scheme and good crops are obtained. The climate is dry and fairly hot, and therefore does not favour the development of this fungus disease.

Conditions in the Western Cape were unfavourable for seed production because the rains were poor.

In general the 1972/73 production season was one of the worst in the history of the maize industry. On the whole the seed-producing areas in the South-Western Transvaal and the North-Western Cape were hardest hit by the drought.

Crop	S.A. Seed Certification Scheme	Export Seed Scheme	O.E.C.D. Scheme	Total (kg)
(a) *Vegetable crops*				
Total 1972/73	1 163 562	47 734	–	1 211 296
(b) *Field crops*				
Total 1972/73	40 029 333	–	62 000	40 091 333
(c) *Pasture crops*				
Total 1972/73	29 504	–	–	29 504

The production of vegetable seed showed a drop of 358 372 kg, which may be ascribed chiefly to drought during the production season. 947 298 kg more hybrid maize seed and 154 901 kg more seed of other field crops was certified than during the previous year.

The production of *cotton seed* increased by 92 714 kg over the previous year's figures. An even greater increase is expected next year.

Participation in schemes

Forty dealers and co-operatives and 702 growers participated in these schemes, i.e. the number of growers dropped by 147.

The steady downtrend may be ascribed chiefly to the fact that surpluses of seed built up during good production years, particularly in the hybrid maize industry.

Seed Production

Conditions for the production of seed of all crops were generally poor, except in the Little Karoo, where conditions were favourable. Owing to the favourable conditions there, more seed on a smaller area was certified than during the previous season.

Owing to downy mildew *Peronospora schachtii*, which is common in the Oudtshoorn area, increasing quantities of beetroot seed are produced on the

The following tables show the relative importance of the various sources of hybrid maize seed:

Source	1972/73	1971/72
Certified public hybrids	50%	57%
Certified private hybrids	30%	30%
Uncertified private hybrids	20%	13%

The main white seed hybrid is PP 4 K64r (30,7 per cent of the total crop) and the most important yellow hybrid is SSM 42 (19,9 per cent).

52,7 per cent of the total crop was white hybrid seed and the rest yellow hybrid seed.

In comparison with the figures for 1971/72 this showed a swing of 15,2 per cent in favour of white hybrid seed.

Seed Production Research

Overseas firms are interested in the production of seed of certain kinds of crops and cultivars for export.

Pilot trials with a number of these crops led to local firms being approached to establish whether it would be economic to produce seed of *Raphanus sativus* (Oil-bearing radishes) and *Brassica nigra* (brown mustard) on a large scale in the Republic.

International Seed Services

Through the Division of Seed Control the Republic is represented in several international seed organisations.

O.E.C.D. Seed Certification Schemes

On 31 October 1972 the Republic was admitted to the O.E.C.D. Certification Scheme for Vegetable Seed. (The Republic already belongs to the O.E.C.D. Certification Scheme for Forage Crop Seed.)

62 000 kg of basic seed of an overseas lupin cultivar was produced under the O.E.C.D. Scheme for Forage Crop Seed.

The International Seed Testing Association (ISTA)

Good progress is being made with the overhauling of the international seed testing rules. As Chairman of the Seed Moisture and Storage Committee, Mr J.F. van Wyk, the Director of the Division of Seed Control, held discussions with a representative of the International Standards Organisation (ISO) in Paris, with a view to correlating the ISTA and ISO rules for determining the moisture content of seed.

In his capacity as member of the Executive committee Mr van Wyk attended the inter-convention meeting of the Association in Copenhagen. Thanks to a donation received from the Seed Merchants' Association of the Republic, Miss E. Robert was able to join the working party arranged by ISTA in Copenhagen.

The European Economic Community (EEC)

Close liaison was maintained with the EEC with regard to broad principles for seed standards.

On 20 July 1972 the Council of the EEC granted recognition to seed certification in South Africa. Seed of the kinds certified by the Division of Seed Control was declared equal to seed in the corresponding categories certified in the Community.

The Council of the EEC also allowed South Africa to export lupin seed of the category "commercial seed" to the EEC up to 30 June 1976.

SARCCUS

Technical aid was given to the various members of SARCCUS. The Director of the Division of Seed Control attended the meeting of the Committee for Plant Production in Nova Lisboa, Angola.

Seed imports

The total quantity of seed of declared kinds imported for all purposes was 3 128 432 kg. Of this quantity 88 226 kg was imported for special purposes such as trials, basic seed, canning or re-export.

3 040 206 kg of seed (1 447 765 kg less than during the previous year) of all declared kinds was imported for the ordinary seed trade. There was a marked drop in imports of maize and grain sorghum seed (766 670 kg and 717 700 kg, respectively, less than during the previous year).

On the basis of the mass of seed imported, the various groups of crops constituted the following percentages, in comparison with the previous year:

Kind	**1972/73**	**1971/72**
Vegetable crops	38,18%	22,38%
Forage crops	30,64%	22,19%
Field crops	29,66%	53,16%
Forage legumes	1,52%	2,27%

NATIONAL COLLECTION OF INSECTS

General collection

Two field trips were undertaken, the area surveyed including sectors of the northern and north-eastern Transvaal. Supplementing the satisfactory catches made on these trips, much new material was collected by other personnel of the Plant Protection Research Institute. New material has also been acquired through consignments of material submitted to the National Collection of Insects for naming.

Four large collections of insects have been transferred to and incorporated in the General Collection.

Apart from several groups of Hymenoptera and a great number of smaller lots of insects in most orders sent for naming, during the past year major consignments of the following groups of Coleoptera were sent to various specialist taxonomists for revision: Dermestidae, Dynastidae, Galerucidae, Lucanidae, Graphipterini (Carabidae), Anomalini (Tenebrionidae).

Termites

One termite survey was undertaken during the year under review, the first of four expeditions to Rhodesia, each of six weeks duration, to be carried out annually from 1972 to 1975 inclusive during the months October/November. This project is being undertaken jointly by the Plant Protection Research Institute, Pretoria, the Plant Protection Brach of the Department of Research and Specialist Services, Salisbury, and the Atlantica Ecological Research Station, Salisbury.

The first survey expedition sampled the termite fauna at 120 collecting stations. The total yield to the National Collection of Insects (N.C.I.) colony samples in 35 genera of Isoptera. As at 30 June 1973 the N.C.I. held an aggregate 28 498 series of Isoptera.

Among the many highlights of the first Rhodesian termite survey the following merit especial mention. One series from the district Insiza has been found to represent a new genus and species of Termitinae. The genera *Cryptotermes* Banks, *Skatitermes* Coaton, *Ovambotermes* Coaton, *Pericapritermes* Silvestri and *Spatulitermes* Coaton were recorded for the first time in Rhodesia. It was established that there are strikingly similar termite faunas in Woodlands on Kalahari Sand which occur in North-eastern South West Africa and western Rhodesia.

A comprehensive study of the taxonomy of the genus *Allodontermes* Silvestri is well under way. In the N.C.I. there are deposited 994 colony samples of which only 30 had previously been determined to the species.

With the publication in July 1972 of W.A. Sands' study of the soldierless termites of Africa the way was cleared for the revision and completion of a manuscript catologuing types of Isoptera deposited in the N.C.I. The manuscript has been submitted for publication.

Four papers on African Isoptera were published in 1973.

No deliberate surveys of South African termitophiles could be undertaken but, as a side issue to termite collecting in Rhodesia, 29 specimens of termitophilous Coleoptera (1 Pselaphidae and 28 Staphylinidae) were taken from nests of *Schedorhinotermes, Skatitermes, Trinervitermes* and *Fulleritermes* species. At present this material is being studied by specialist taxonomists abroad.

During the year under review specialists have returned for deposition in the N.C.I. 39 series of named termitophilous Insecta in 16 species of Coleoptera (Staphylinidae, determined by Dr D.H. Kistner: 11 species of which 4 were described as new; Pselaphidae, determined by Dr N. Leleup: 4 species of which 2 were described as new; Carabidae, determined by Dr T.L. Erwin: 1 species), and in one species of Heteroptera (Lygaeidae, determined by Dr J.A. Slater: a new genus and species).

Scale insects

Armoured scales – The only field survey trip was undertaken in October 1972 to Namaqualand. This visit yielded 65 accessions, a proportion of which is still being studied; the rest, already mounted and fully identified, has established many new host plant and locality records for South African species.

One accession proved to be a new species of the genus *Hulaspis* Hall.

The discovery of a new species of *Ischnaspis* Douglas in the Northern Transvaal, reported on in the previous annual report, triggered off a revision of this genus which apparently is of African origin. The results of this study are compiled in a paper which has been accepted for publication.

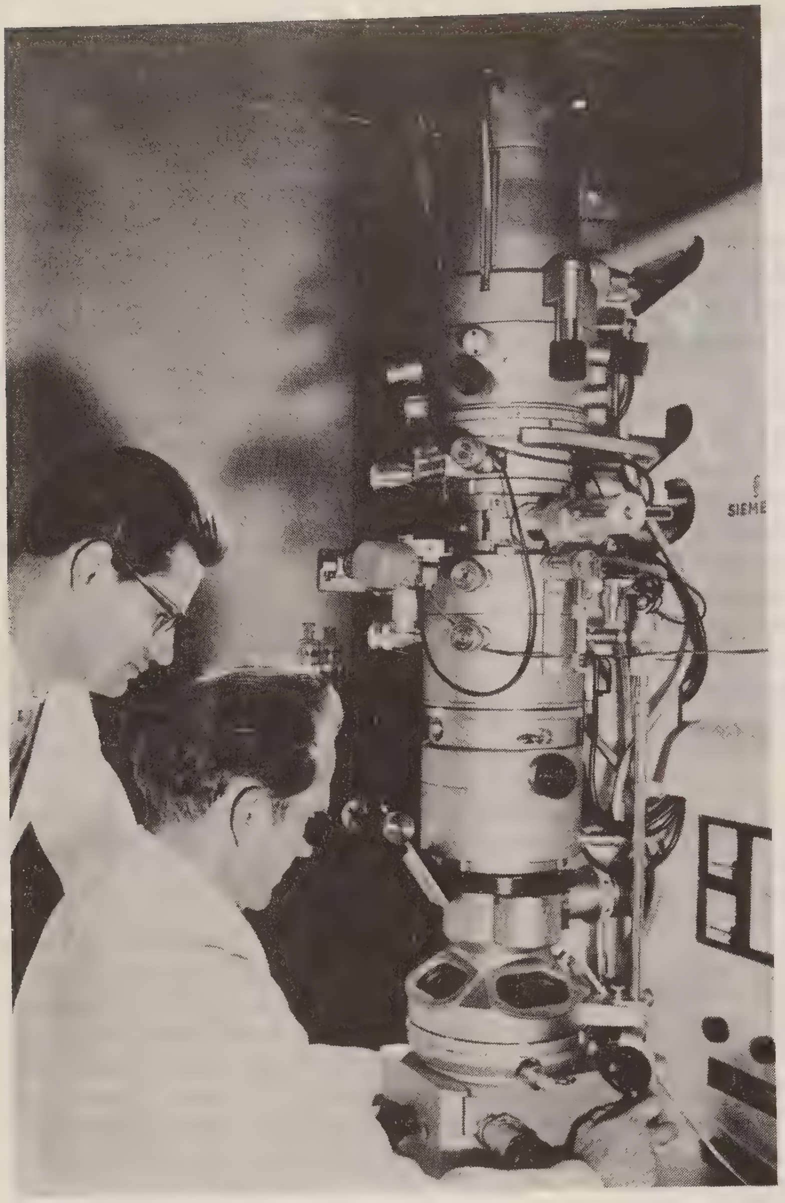
A contribution was made to knowledge of the genus *Africaspis* MacGillivray by compiling descriptions of three new species, one from South Africa, one taken in both South and South West Africa, and the third species in Australia. In the same paper also will be published a paper describing a new species of *Africonidia* McKenzie taken in 1972 during the course of a collecting trip in Zululand.

Soft scales, mealybugs and cochineal insects – Identifications were made for and advice was given on soft scales, mealybugs and cochineal insects to various researchers and institutions in South Africa as well as in Angola, Argentina, Bolivia, Brazil, Greece, Israel, Italy, Mozambique, Rhodesia, South Korea, South West Africa, United States of America (Texas), Turkey and Uganda.

Practically undivided attention was given to a taxonomic revision of cochineal insects of the genus *Dactylopius*. Following the study of types and other original material borrowed from the British Museum (Nat. Hist.), London and from the United States National Museum, Washington, D.C., it has been possible to settle the identity of all old species, including that of *Dactylopius opuntiae*, on the status of which there has been much confusion in the past despite its being the most common cochineal insect attacking some pest species of prickly pears in South Africa and Australia.

The species introduced long ago for the control of the jointed cactus *Opuntia aurantiaca* which for many years was referred to by South African and Australian entomologists as *Dactylopius* sp. near *confusus*, has been named and described from specimens from the eastern Cape Province.

Three new species of cochineal insects have been found among material collected in Argentina by Mr H. Zimmermann. These have been fully described and



Detailed and accurate observations can be made with the electron microscope which is an important modern aid for the agricultural scientist

illustrated. Altogether nine species, five old and four new, are recognised as valid at present.

Locusts and grasshoppers

Three major field expeditions were made to such widely separated areas as Namaqualand, Caprivi Zipfel and Central Moçambique which together added 1 700 grasshopper and 1 100 miscellaneous insect accessions to the collection. Two of these expeditions were made in connection with red locust *Nomadacris septemfasciata* Serv. surveys, leading to timely control measures and delimitation of certain areas as suspect locust habitats requiring further surveillance.

An illustrated article describing a new grasshopper was prepared and submitted for publication. The new taxon is part of the little-known *Loryma* group, for which a key to genera is provided, and represents a genus and species new to science.

Tree hoppers and jumping plant lice

After 13 years of service Mr A.L. Capener retired in December 1972. During these years two groups of insects received his special attention, the Membracidae and Psyllidae, and the National Collection's holdings in these groups are as follows:

Membracidae – In 1959 the National Collection of insects contained about 100 specimens of Membracidae, whereas it now houses one of the most complete African collections in the world: 54 of the 60 described African genera are represented and about 270 of the 456 described species. No less than 160 holotypes and/or paratypes are included.

In addition to African material, there are 6 300 specimens collected in North and South America, Australia, India, Japan, New Guinea and the Philippines.

This material comprises 212 species in 84 genera, and there are some 800 undetermined specimens.

Psyllidae – From about 100 specimens this group's representation has been increased in the National Collection to about 10 000 specimens. During recent years the number of species known from the Republic has been increased from 40 to 66 and two new genera were described.

Fruit flies

Identifications of Tephritidae were undertaken for institutions in Sao Tome, Angola, Rhodesia, Mauritius, Reunion and France.

Important dacine material was received from Dr Greathead of Uganda and this is being included in the monographic study of the Dacinae of Africa. Steady progress has been made towards finalising this research project.

Mites

Mite accessions during the year under review amounted to 781, and 914 identifications were made.

Two collecting trips yielded 387 specimens: 234 were collected in Northern Natal and 73 in the Northern Transvaal.

Taxonomic studies were continued and a review of the phytoparasitic family Tetranychidae in Africa was completed and submitted for publication. The work gives a general overview of the distribution, classification and external morphology of 247 old and new species. In addition, 117 species that have already been described are defined, and each description is followed by a comprehensive list of host plants and localities which includes new locality records. 130 new species and 8 new genera have been discovered and are described in this work.

Plant lice

H.D. Brown in 1972 published two papers dealing with various predators of the wheat aphid *Schizaphis graminum* (Rond.). In these are compiled results of research work completed some years ago.

Jewel beetles

Three major surveys of Buprestidae were undertaken during 1972-73: the Namaqualand district, C.P. yielded 330 specimens including three new species; the Waterberg sector of the Transvaal yielded 460 specimens in which are represented one new species and a long series of many old species; an expedition to the Kalahari of Botswana yielded 530 specimens including two new species and many rare old species.

Many interesting records of distribution of Buprestidae in Southern Africa were established through this field work.

The specialised collection of Acmaeoderini in the National Collection of Insects today is perhaps the most complete collection in the world of African species of this tribe. Work on monographing the Acmaeoderini is nearing completion. Many thousands of specimens and 130 more types have been received on loan during the past year. The types of just on 400 of approximately 500 named species of this tribe have now been studied. The types of an additional 75 species have recently been traced and it is hoped to borrow this material for study in the near future.

By June 1973, 55 descriptions have been finalised with 60 more completed in draft form, 82 of the 85 colour illustrations are complete and distribution maps of 115 species have been plotted. The manuscript should be complete and ready for publication towards the end of 1973.

Nematodes

The national collection of nematodes now comprises 10 200 plates, representing 50 360 specimens.

The study of the plant parasitic genus *Scutellonema* has been completed. Five kinds from South Africa are described in it, as well as a key compiled for the 12 species found in South Africa.

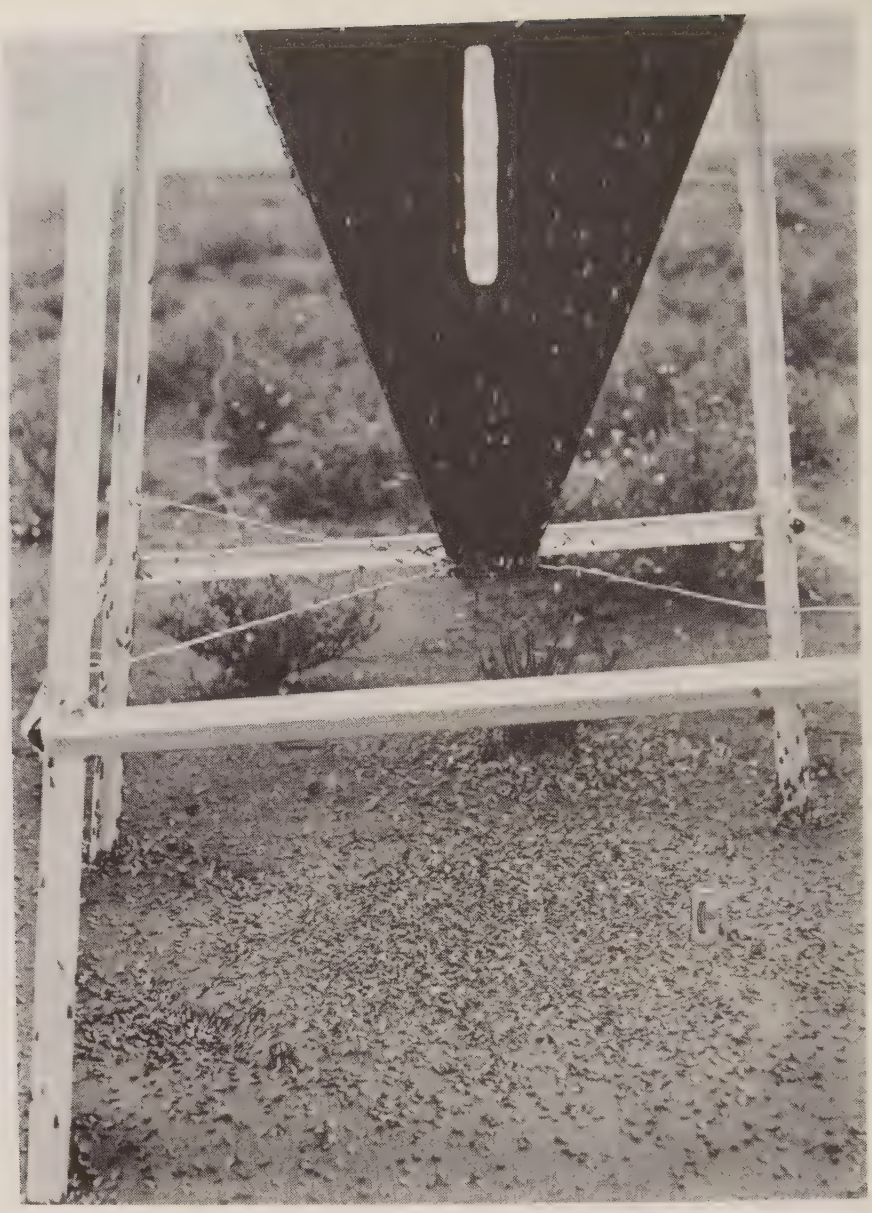
A study of the families Monhysteridae and Tripylidae has also been completed in which two new kinds from South Africa are described.

CONTROL OF OTHER ANIMAL PESTS

Golden nematode

From March to June 1973 an intensive survey was carried out in the areas that previous surveys showed to be infested with the potato cyst nematode *Heterodera rostochiensis* and these areas were then placed under quarantine. In the absence of host crops the nematode populations in the soil decreased considerably: on 14 farms (23 per cent of the total number of farms sampled) no infestations were found. 992 ha was sampled and 3 308 samples were taken.

A rotational cropping trial with non-host crops of the potato cyst nematode has been in progress on infested soil at Bon Accord since June 1971. During the



A light-trap funnel filled to capacity by one night's catch of Karoo caterpillar moths

period June 1971 to February 1973 the number of cysts per unit of soil (200 g) decreased by 24 per cent on average and the number of live eggs inside the cysts by 81 per cent on average.

The rate of decrease rises during spring and early summer.

Two potato cultivars and 50 breeding strains were imported from the U.S.A. and tested for resistance to the South African race of the potato cyst nematode. The inability of the larvae to develop into adult females in the "presence" of the potatoes indicates that both the cultivars and a number of the breeding strains may be resistant.

Bio-ecological trials with the potato cyst nematode showed that tomatoes and egg fruit are both good hosts for the nematode.

Root-knot nematode

The root-knot nematode *Meloidogyne* spp. is still a serious pest and attacks a variety of agricultural crops. Complaints were received from various parts of the country that the nematode can no longer be adequately controlled by means of the fumigant ethylene bromide. A fumigation trial with this preparation showed that the nematode can be controlled effectively if the prescribed precautions relating to soil moisture, soil temperature, tillage and the depth of application are taken.

A fumigation trial at Vaalharts, in which this preparation was used against root-knot nematode in cotton, resulted in a four-fold increase in yield.

A fumigant (ethylene bromide) and a systemic preparation (aldicarb) were tested for the control of nematode in cotton near Jan Kempdorp. The results obtained so far show that these two preparations did reduce the nematode population, resulting in a higher cotton yield.

The interaction between *Meloidogyne incognita* and *Fusarium oxysporum* was studied. It is apparent from the results that the plants are affected more when both pathogens occur at the same time than when they occur separately.

Burrowing nematode

Forty-nine farmers in the Eastern and Northern Transvaal submitted applications to sell or replant of banana propagation material last season. Several specimens were taken from the farmers in question to establish whether burrowing nematode was present. No infestation was found and 49 transport permits were issued.

Red-billed finches

During the past season the extent of the campaign against the red-billed finch *Quelea quelea lathamii* was about average.

All told, 152 areas with a combined extent of 1 368 ha, were sprayed. It is estimated that 85 million finches were destroyed.

The peak of the spraying season occurred in February 1973, when 38 areas with a combined size of 422 ha were sprayed. During that month 27 million finches were destroyed.

Mites

Tetranychus urticae, which was found in large numbers on maize in the vicinity of Delmas, Devon and Leslie, occurred late last season. The infestation was therefore considerably less than in previous seasons. This species was found at Ficksburg for the first time this year, where it damaged peaches. It was also identified for the first time at Nelspruit, Groblersdal and in Rhodesia.

The following wild plants are the hosts of this species of mite: *Cosmos bipinnatus, Tagetes minuta, Gnaphalium luteo-album, Verbena officinalis, Oxalis* sp., *Conyza bonariensis* and grass.

A great deal of trouble was experienced with the control of *Tetranychus lombardinii* on tomatoes with the aid of dicofol in the Pietersburg area. It was found that the cover obtained on the undersides of the leaves was not good. Consequently effective control of this species of mite is impossible because the mites are well protected by a web on the undersides of the leaves.

The citrus red mite *Panonychus citri* (McGregor) again occurred in large numbers in the Rustenburg area, where control measures were applied in certain cases. This species was identified on citrus for the first time at Pongola.

Hermitarsonemus latus damaged green peppers (*Capsicum* sp.) at Durban for the first time.

Forest and timber insects

A total of 328 100 cubic metres of imported timber was examined for harmful insects during the year under review. No timber was rejected.

INSECT CONTROL AND RESEARCH

Some 400 applications for registration and/or amendments to existing registrations of insecticides, fungicides and rodenticides have been reviewed and recommended for registration under Act 36/1947.

The annual departmental communication, A Guide to the Use of Insecticides and Fungicides in South Africa, was updated and appeared in August 1972. This edition was completely revised with a view to making the vast amount of information on the correct and safe use of pesticides available to the general public.

During February an Afrikaans updated edition "'n Handleiding vir die gebruik van Plaagdoders en Swamdoders in Suid-Afrika" was published.

Brown locusts

The campaign against the brown locust *Locustana pardalina* Walker was conducted on a fairly small scale during the past season.

During the last half of October and the beginning of November 1972 isolated small hopper swarms occurred in the districts of Koffiefontein, Fauresmith and Douglas. Only two control teams were needed to destroy these few swarms.

Outbreaks occurred on a slightly bigger scale during the first half of March 1973 in the vicinity of Pofadder. Eight control teams were busy in this area for fourteen days.

Red locusts

On 3 August 1973 a big swarm of red locusts *Nomadacris septemfaciata* Serville was spotted at Goonda, near Beira, in Mozambique, and on 31 August 1972 swarms of red locusts crossed the eastern boundary of Rhodesia in the vicinity of Umtali. Eleven swarms were destroyed by the Rhodesia authorities.

Surveys of the Buzi Flats, just south of Beira, were undertaken by Rhodesia, Mozambique and the Republic jointly during September 1972, March 1973 and June 1973.

The survey during June 1973 showed that there were concentrations of red locusts on the Buzi Flats. The Republic played a leading role in the control of these concentrations.

Termite control

Night-flying insect populations were sampled by means of light traps in order to establish whether dieldrin cover sprayings for the control of harvester termites would have any effect on these insect populations. The only population very badly affected by the spraying was *Pseudohippopsis filiformis* Gestro. Only small numbers of these beetles, whose larvae are probably wood-eating, were caught in the light traps from May to August.

None of the populations of the species of soil-inhabiting beetles sampled by means of pit traps were found to have been affected either adversely or beneficially by the spraying. The sampling of a variety of insect species by means of suction traps and aldehyde traps did not show that the spraying had any effects either.

It is clear that cover spraying of the natural pasture with dieldrin in winter in order to control harvester termites will not seriously disturb the insect populations present.

The Karoo caterpillar

Extensive outbreaks of the Karoo caterpillar occurred. No magisterial district in the Karoo Region escaped the pest entirely. In most cases two generations of larvae occurred.

Trichlorfon gave the best results of the chemical preparations tested so far. However, the cost of spraying makes it uneconomic for the individual farmer, particularly when one takes into consideration that one spraying per season is no safeguard against a further outbreak during the same season.

Armyworm

Armyworm *Spodoptera exempta* Walk. outbreaks for the current year were worse than for the immediately preceding years and 118 535 ha were infested. The biggest outbreaks occurred in the Transvaal.

American boll-worm

Higher numbers of the American boll-worm *Heliothis armigera* Hübn. were recorded at most sites during September and October. In December lower numbers than the previous year were caught at certain Transvaal traps. The numbers further declined until February. An increase in numbers occurred in March, but the averages at most sites were lower than the averages for the previous year.

The vygie caterpillar

The vygie caterpillar *Mesocelis spp.* is one of the chief insect pests on vygie plants in the North-Western Cape and Namaqualand. Stock farmers in that area rely heavily on that plant for summer grazing.

An investigation carried out towards the end of the winter of 1972 yielded only a few larvae in areas where tens of thousands of larvae of the *Mesocelis spp.* were found the previous season. Field observations confirmed laboratory findings that a disease, presumably bacterial, which appeared late the previous season hit the insect hard. This disease prevented most of the larvae from pupating.

Insects in stored products

The preparation Bayer 5621, which made a good showing last year when used to protect bag stacks, was tested this year at half the previous dosage and gave excellent protection even at this low dosage. This preparation is therefore well able to compete in price with the preparations registered at present.

A number of new phosphine preparations were tested for the fumigation of bag stacks of maize and groundnuts, and for the fumigation of unshelled groundnuts in bulk and shelled edible groundnuts in railway trucks in transit to the port of export. All the preparations seemed satisfactory, although the dosages at which they were tested were generally considerably lower than the dosages at which phosphine is registered at present.

Bayer 5621 made a satisfactory showing as a seed protectant for maize, groundnuts and grain sorghum seed, particularly when one takes into account that it was tested at far lower dosages than the mercaptothion/captab mixture registered for that purpose.

An established infestation of the dreaded khapra beetle *Trogoderma granarium* Everts was reported at Onseepkans along the Lower Orange River. Large-scale control measures were applied there after it was found that the pest was confined to Onseepkans. This control campaign was largely successful, but cases came to light that indicated that the distribution was wider, possibly spreading as far south as Vredendal and as far north as Stampriet in South West Africa.

Khapra beetle is a real threat only in the very hot and dry areas of the country, and the chances of its spreading to the big grain-producing areas are therefore relatively slight.

Forest and timber insects

An investigation was instituted into the kino vein problem (lesions in the wood), which is hampering the utilisation of Eucalyptus timber to such an extent that the Department of Forestry is seriously considering whether the planting of *Eucalyptus maculata* (spotted gum), a hardwood species for which there is no substitute, should be discontinued.

Preliminary research in certain forest reserves in Zululand has produced very promising results. Firstly, it was established that mechanical damage in particular or damage caused by the bark beetle *Croasotarsus externe-dentatus,* as well as inter- and intra-specific differences in *Eucalyptus* spp., affects the formation of kino veins.

Kino vein formation was also successfully stimulated by infecting eucalyptus trees artificially with *C. externe-dentatus,* so that the damage to the cambium and the subsequent development of kino veins can be systematically studied. During clearfelling in November 1972 an *E. maculata* tree that is very probably resistant to this defect was discovered. An examination of the trunk up to a height of about 30 m revealed that no kino veins were formed during the entire growing period of the tree. This tree will be considered for the propagation of an *E. maculata* cultivar that is resistant to this defect, and for use in the study of the causative factors.

BENEFICIAL INSECTS

Biological control of –

Potato tuber moth

Three large-scale commerical table potato plantings were evaluated for the effectiveness of biological control of the potato tuber moth *Phthorimaea operculella.* The areas involved were Davel (10 ha), Leslie (15 ha) and Eloff (200 ha). No insecticides were applied to the lands under study and a strict ridging programme was followed.

During the first half of the season drought conditions prevailed and this affected the ridging programmes which in turn affected the tuber moth control.

Early plantings at Davel, Leslie and Eloff exhibited 0,74, 9,40 and 11,60 per cent tuber moth damage of the total crop. Middle and late season plantings at Eloff exhibited 6,0 and 1,6 per cent tuber moth damage at harvest. The two imported parasitoids *Apanteles subandinus* and *Copidosoma koehleri* were the most effective parasitoids in reducing the tuber moth populations.

Trials were conducted in an attempt to utilise this type of control measure in the production of seed potatoes. At this stage the application of granular soil systemic insecticides for aphid and virus control are the most promising, because this type of treatment has a minimal effect on the beneficial insect complex.

Orgilus lepidus, an imported parasitoid, was released on the Transvaal Highveld to complement the other tuber moth parasitoids. Releases were concentrated in the Eloff area, but recoveries were disappointing. It is unlikely that this species has become established.

A survey of the imported parasitoids established their presence in the potato-producing areas of the Transvaal, Free State and the North-Western Cape. It is probable that their dispersal has extended to all the potato-producing areas of South Africa.

Lantana camara

One consignment each of *Octotoma scabripennis, Uroplata girardi, Plagiohammus spinipennis, Teleonemia elata, T. scrupulosa* and *Leptobyrsa decora* was received. *Octotmo* and *Uroplata* were released at Buffelspoort directly and small numbers were kept for mass breeding in Pretoria. *T. elata* was released in Durban and Pietermaritzburg.

Leptobyrsa decora was finally tested on jacaranda and no oviposition, feeding and therefore development were observed for three generations under quarantine conditions. It is therefore recommended that this insect be released directly in future.

O. scabripennis became established at Buffelspoort, Transvaal, after initial releases during 1971. Breeding problems with *Plagiohammus spinipennis* were solved, and at present small nucleus cultures of both the twelve-month strain and the three-month strain are available.

Silverleaf bitterapple Solanum elaeagnifolium

A survey of insects associated with the silverleaf bitterapple and two closely related species of *Solanum* was made in North-Western Argentina, part of the natural home of this plant which is a dangerous weed in South Africa.

A number of species were found, two of which were imported for further study in South Africa. In Argentina neither is recorded as a pest of cultivated *Solanums,* such as tomatoes and potatoes, but in quarantine in South Africa one of them readily attacked tomatoes, so it was destroyed.

Further work will be required before deciding about releasing the other species in South Africa.

Opuntia aurantiaca

The research in South America on insects associated with jointed cactus *O. aurantiaca* was finalised. Several species of insects, including cochineals and moth-borers, were discovered attacking plants closely similar to jointed cactus in Northern Argentina and Bolivia.

Nucleus stocks of some of these living insects were received for further study in quarantine conditions.

Hakea spp.

The snout beetle *Erytenna* vt. *consputa,* which destroys young hakea fruits, multiplied to such an extent in the field cages in the vicinity of Wemmershoek that they were allowed to spread to plants outside the cages. The multiplication of this insect and the destruction of fruit in a trial plot at Stellenbosch were also very encouraging.

Carposona antolaga, the larvae of which destroy hakea seeds, showed only slight progress in veld quarantine cages during the previous two seasons, but multiplied rapidly during the past season despite an exceptionally dry autumn. They are now thought to be sufficiently adapted to local conditions for release and establishment in the veld in the near future to be considered.

Hypericum perforatum

The following additional insects were imported during the past year to supplement the established *Chrysolina gemellata* beetle in the campaign to control St John's Wort. These insects include:

The gall midge *Leuxidiplosis giardi* (Cecidomyidae), which was imported from Australia in December 1972. After the imported colony had been purified of its natural parasites, the midges were released near Stellenbosch. Recoveries have already been made from these releases.

A new stock of *Chrysolina hyperici* was imported from Canada and the first beetles were released in May 1972.

The promising root and stem borer *Agrilus hyperici* was imported from California. Attempts are being made at present to adapt the life cycle of this insect to the different conditions of the Southern Hemisphere.

During the autumn of 1973 about 1 000 *Chrysolina gemellata* beetles were released in the vicinity of Stellenbosch in the Tulbagh district to tackle a new infestation of St John's Wort.

Honey-bees

An awareness of the need of the bee-keeping industry to crystallise and co-ordinate its activities has developed. This trend culminated in the establishment of a standing apicultural advisory committee under the chairmanship of Dr I.H. Wiese. The committee is to advise the Plant Protection Research Institute and promote the growth of the Republic's bee-keeping industry.

The Institute has anticipated these needs to a degree. The final manuscript of the bee-keeping bulletin was submitted to the Information Division during the year. The bee-breeding project has just recently been registered, but selection work has been going on since 1963 on an isolated island.

In addition an expedition was made to the dry parts of South-West Africa to collect honey-bee colonies to augment this breeding material. This area was selected because it held the promise of providing essentially stable or swarm-resistant material. At the conclusion of the trip, 25 colonies were transferred to the island for evaluation before being included in the breeding stock.

MYCOLOGY

Identifications

During the year a total of 817 fungi were identified on a variety of host plants and other substrata. A number of interesting species were found for the first time. Among these were *Diaporthe phasedorum* var. *sojae* on soybean plants; *Hendersonia* sp. on mango fruit; *Nigrospora oryzae* on rice; *Alternaria zinniae* and *Peronospora* sp. on *Tribulus terrestris* (the first records of fungus pathogens on these plants); *Ascochyta pinodes, Phoma glomerata* and *Phomopsis* sp. on pea seed; *Ustilago syntherismae* on *Acroceros* sp. (Nile grass), *Beauvaria bassiana* on biltong, *Botryotrichum piluliferum* and *Scopulariopsis brevicaulis* on bagasse and *Ascohyta* sp. on groundnut.

Good autumn rains brought a good crop of mushrooms of which many were brought in for identification. Specimens sent in to the Mycology Section after a serious case of mushroom poisoning in Sabie, E. Transvaal, were identified as *Amanita phalloides.* This is the first record in the fungus herbarium of *Amanita phalloides* occurring under pine trees in South Africa.

Curatorial work – A total of 95 fungus specimens were incorporated in the Herbarium. These include dried down cultures as well as specimens on the natural substrate.

A total of 22 cultures were sent overseas for inclusion in other culture collections or as gifts or exchanges whilst 15 herbarium specimens were sent out on loan. A total of 5 specimens were received on loan for study from other institutions.

Visitors

The fungus herbarium received a large number of visitors. Among these were many local and foreign scientists. About 60 members of the general public sought information on the edibility of mushrooms.

Research

Considerable progress had been made during the year with research on various projects.

Downy mildew fungi of maize – Collecting trips were undertaken to the Warmbaths – Nylstroom area of the Springbok Flats, the districts of Bronkhorstspruit, Middelburg, Ermelo, Piet Retief in the southeastern Transvaal and the Vryheid, Dundee, Pietermaritzburg districts of Natal to determine the presence of downy mildew fungi in maize and sorghum. The disease was found only on the Springbok Flats where individual maize and sorghum fields showed from 1 to 25 per cent of infected plants, despite rather extensive drought conditions.

The causal fungi were identified as *Sclerospora graminicola* and *Sclerospora sorghi.*

Seed-borne fungi – A programme of research on seed-borne fungi and seed-borne fungal diseases was started during this year with onion seed as the first seed to be examined. It was found that the percentage of seeds infected by fungi varied from 60 to 100 per cent. Most of these fungi are entirely superficial. Sterilization of the seed surface prior to planting out shows only 1 to 27 per cent of seeds to be infected internally, although in one exceptional case 62 per cent of seeds were infected internally.

The important species of the surface flora are *Cladosporium cladosporioides, Alternaria alternata* and *Rhizopus oryzae.* Pathogenic fungi such as *Fusarium* spp. usually made up a small percentage of the fungus flora, whilst *Stemphylium botryosum* was also present in small numbers on most samples. *Botrytis allii* was found in one sample only whilst the virulent pathogen *Alternaria porri* was absent from all samples.

Species of the genus *Aspergillus,* notably *Aspergillus niger, A. flavus* and *A. ochraceous* were present on all samples, often in fairly high numbers. This also applies to species of *Penicillium* mostly *Penicillium notatum* and *P. cyclopium.* Species of these two genera are important as inhibitors of germination and the causes of deterioration of seeds in storage.

Edible and poisonous mushrooms – Good autumn rains produced a good flush of mushrooms which allowed photographs in colour to be taken of several species. These included *Agaricus xanthodermus,* a poisonous species, *Lycoperdon hyemale, Phallus rubicundus, Geastrum fornicatum* and *Podaxis pistillaris.*

These additions now bring the number of species photographed and described to 20, but more species should be figured in order to increase the appeal and usefulness of the popular book which is being prepared.

Toxin producing fungi – Approximately 480 kg of maize were inoculated with *Phomopsis leptostromiformis,* the causal fungus of lupinosis in sheep. The culture material was dried and supplied to organic chemists at Onderstepoort for isolation and characterisation of the toxin. It was found that *P. leptostromiformis* does not produce the lupinosis toxin on either malt-extract broth in shake culture or malt-extract agar.

In co-operation with the Toxicology Section of the Veterinary Research Institute and the National Chemical Research Laboratory of the C.S.I.R., 11 isolates of *Pithomyces chartarum* from South Africa, New Zealand and North America were tested for sporidesmin production. Three South African strains, all isolated from pastures at Humansdorp and one strain each from New Zealand and the United States, were found to produce detectable quantities of sporidesmin in culture.

Fungi were isolated from samples of plant material collected at four different localities where outbreaks of photosensitivity in sheep occurred. A total of 35 different species of fungi were identified. Two fungal pathogens of *Tribulus terrestris,* viz. *Alternaria zinniae* Pape and *Peronospora* sp. nov. were found for the first time. Five species of fungi (*Alternaria alternata, Alternaria zinniae, Phoma glumarum, Fusarium* sp. nov. and *Phaeoramularia* sp. nov.) were tested for toxicity to sheep with negative results.

Approximately 190 kg of maize were inoculated with *Fusarium moniliforme* and the culture material supplied to the Toxicology Section of the Veterinary Research Institute for toxicity trials in horses and small animals. One donkey and three horses died. The gross pathological lesions were haemorrhages, oedema, icterus and liver damage. The culture material was dosed to sheep, guinea pigs, ducklings and mice with negative results.

LEGUME RESEARCH

Research in respect of leguminous crops undertaken by the Plant Protection Research Institute deals mainly with the *Rhizobium*-legume symbiosis.

The most effective *Rhizobium* strains for legumes grown in the Republic were selected and supplied to manufacturers of inoculants.

Inoculants were manufactured by two companies this year. Of the 86 batches of inoculant manufactured, 49 were approved by the Plant Protection Research Institute for marketing. Fifty per cent of one manufacturer's inoculants were approved for marketing compared with 73 per cent from the second manufacturer.

New *Rhizobium* strains continue to be isolated for leguminous crops which have potential as pasture crops. Strains are also supplied to all organizations in the country that conduct trials with legume crops. Altogether 193 inoculants for 30 different legume crops were provided for this purpose.

METEOROLOGICAL RESEARCH

During the year under review several questionnaires were received from the Committee for Agricultural Meteorology of the World Meteorological Organisation and distributed. This information will be summarised by special working groups in technical reports dealing with specific problems in agricultural meteorology.

The first official meeting of the Agricultural Meteorology and Climatology Subcommittee of the Permanent Committee on Soil Conservation and hand Utilisation Planning of SARCCUS took place in Salisbury in March 1973 under the chairmanship of an officer of the Soil and Irrigation Research Institute. A progress report on research in Southern Africa on agricultural meteorology was drawn up during this meeting.

Collection of meteorological data

In addition to the data collected by the Weather Bureau, meteorological data are collected at a number of weather stations maintained by agricultural meteorologists of the Department of Agricultural Technical Services. A survey of requirements was made and it is estimated that it will take about two years to make provision for supplementary data. These data are essential for long-term planning in the agricultural sector in accordance with the principles of optimal land utilisation.

Two additional weather stations were included in the network, bringing the total number to 15 in citrus and subtropical fruit production areas. These two additions, at Kaalrug and Komatipoort in the South-Eastern Lowveld, are being operated in conjunction with the Sagar Research Station at Mount Edgecombe for the benefit of both the subtropical fruit and sugar industries.

A further expansion of the weather station network is under way. This expansion involves establishing seven new stations at selected sites in banana-producing areas.

Climatic investigation

Monthly temperature data obtained from the Weather Bureau were used to calculate heat and photothermal units for various seasons for points throughout the country. These data were used to delineate more or less homogeneous areas with the aid of a technique that has been developed recently.

Promising results were obtained in the course of research aimed at investigating the effect of altitude and topography on maximum and minimum temperatures.

A windbreak of 13 mm mesh wire-netting, 6 m high and 75 m long. Some of the registering Woelfle-type wind-gauges can also be seen

Investigations into the probable dates of the first and last frosts and the length of the frost season were launched with the development of a suitable computer programme, which includes the analysis of daily minimum temperatures.

Evapotranspiration

Studies of evapotranspiration or water consumption by plants have been carried out by several agricultural meteorologists. Study groups in the vicinity of Worcester were assisted in the use of A pan evaporation values for irrigation scheduling.

At the Addo Experimental Farm measurements of the evapotranspiration of citrus trees were compared with those of the A pan. Montly values of the so-called pan factor (plant factor) varied from 0,6 to 0,9.

Relationships between climate and plant disease

Because the early part of the 1972/73 growing season was characterised by little rain and low moisture conditions, little late blight of potatoes occurred in the Transvaal Highveld.

A preliminary investigation into the part played by rainfall in the incidence of geeldikkop in sheep in the Karoo showed that such outbreaks are characteristic of a long dry season followed by good rains during the hot months.

Wind-break studies

It was found that a wind-break of wire netting, 6 m high, 75 m long and with a mesh size of 13 mm, reduced the open wind velocity by 91 per cent at a distance twice to four times the height of the wind-break. At distances of six to eight times the height of the wind-break the wind was 92 per cent of the open wind velocity, and at twelve times the height of the wind-break it was 94 per cent of the open wind velocity. (In all cases the wind velocity was measured at a height of 2m).

Plant-climate relationships

An analysis of weather data obtained at six points along the Orange River showed anomalies that may be related to the incidence of growth arrestment disease in vineyards.

Investigations into the effect of climate or phenological events during the growing season of deciduous fruit were started during the year under review.

Micrometeorology

Research which included the investigation of the energy balance in an irrigated banana orchard was undertaken.

Analyses made so far indicate that the growth rate (in terms of leaf formation) is positively correlated with heat energy and negatively correlated with crop age. It was found that these two factors explain up to 90 per cent of the variations in growth rate.

Determination of potential

The research work on the maize production potential of Natal included the development of programming techniques for the local computer. Using these techniques the Natal Region was subdivided into homogeneous areas on the basis of various meteorological parameters. The results of the analyses were plotted with the aid of the plotter attached to the computer.

Irrigation planning

A number of tasks in irrigated areas were tackled, including the following:

The reproduction of irrigation soil maps and the interpretation of soil surveys for various departments and other bodies. A number of irrigation board schemes (three in the Transvaal and one in the Western Cape) were visited in order to collect data for economic evaluations.

Information on 38 Government Water Schemes and irrigation board schemes was obtained in order to evaluate viability on irrigation units.

Comprehensive irrigation situation studies were carried out on the Fish River, Makatini Flats, Ramah and N'Komati Irrigation Schemes.

The Hardap Scheme was completely replanned, and this led to the consolidation of all vacant plots and the internal planning of four of the consolidated plots.

A number of irrigation board schemes were visited for purposes of economic evaluation.

Progress was also made with a geohydrologic study of the Vaalharts Government Water Scheme in order to try to find a solution to the waterlogging and brack problem there.

Analytical services

About 14 000 plant, soil, water and other specimens, on which at least 70 000 determinations were carried out, were analysed on behalf of the various regions and institutes of the Department of Agricultural Technical Services and other departments.

873 stock feed samples were taken at the stock feed factories and mills in the Republic and analysed. About 99 per cent of these samples met the prescribed requirements.

AGRICULTURAL TECHNICAL RELATIONS WITH FOREIGN COUNTRIES

Co-operation with African countries

The Department is experiencing an ever-increasing demand for general information on agricultural matters from various parts of Africa, and material, particularly vaccine from Onderstepoort, is still being supplied on a large scale. Technical aid was also given to Lesotho, Swaziland and other countries in connection with matters such as the control of citrus pests, the promotion of livestock projects, wool, and field husbandry.

The Annual General Meeting of SARCCUS was held in Pretoria in September 1972.

It is intended to set up a new organisation for the control of red locusts in Southern Africa to replace the old International Red Locust Control Service which was dissolved in December 1970. Most countries in Southern Africa have already indicated that they are prepared to co-operate. Surveys of red locust numbers have already been undertaken by officers of the Department in the Caprivi Zipfel, Botswana, Mozambique and Rhodesia, and active assistance was given with the control of the pest in Mozambique and Rhodesia.

Very good progress was made with the control of tsetse fly in Rhodesia and Mozambique. An area of about 5 700 square kilometres in Rhodesia, south of the Sabie River, was rid of the fly. In Mozambique, the position was consolidated in the Massangena area during 1972.

Visitors from African countries

The following persons from African countries visited Departmental institutions during the year under review:

Mr José Passos de Carvalho, a lecturer at the

University of Luanda, to make a study of entomological species and the biological and chemical control of citrus pests.

Messrs Gibson and Masupha, of the Department of Agriculture, Lesotho, to collect information on tractor costs, the development of farm machinery, etc., and Mr Monkhi, of the same Department, to study new techniques in connection with horticultural practices.

Chief Maseribane, Deputy Premier and Minister of Agriculture of Lesotho, visited the Karoo Region.

Dr Phororo, Director of Veterinary Services, and Messrs Botha, Kao, Kitleli and Motsopha, of the Departments of Agriculture, Customs and Foreign Affairs of Lesotho, to hold discussions with the Director of Veterinary Services in Pretoria on the matter of issuing import permits for animals and animal products entering the country from Lesotho.

Swaziland's Permanent Secretary for Agriculture, Mr B.M. Nsibandza, for discussions on fruit exports.

Visitors to African countries

The following officers attended meetings and other gatherings in African countries:

Dr P.R. Mansvelt, Director of Veterinary Services, the meeting of the Standing Committee for Animal Health of SARCCUS, Mbanane, Swaziland.

Dr E.B. Kluge, of the Division of Veterinary Services, the preliminary tsetse fly meeting in Salisbury.

Dr P.R. Mansvelt, Dr E.B. Kluge and Dr M. Bachman, of the Division of Veterinary Services, the annual meeting of the Tsetse Fly Control Committee in Lourenco Marques.

Dr P.R. Mansvelt, Director of Veterinary Services, the meeting of the International Foot-and-Mouth Disease Advisory Committee in Salisbury.

Mr P.B. Botha, of the Division of Agricultural Engineering, visited irrigation areas in Mozambique.

Nine officers of the Department, including Dr B.C.Jansen, Chief Director of Veterinary Services, and Dr J.H. Grobler, Director of the Citrus and Subtropical Fruit Research Institute, attended the sixth conference of the International Union of Citrus Virologists in Swaziland.

Twelve officers attended the Fifth Congress of the Soil Science Society of South Africa in Salisbury.

Mr A.L.V. Davis, of the Plant Protection Research Institute, carried out a survey on dung beetles in Rhodesia and Mozambique, in co-operation with Dr Bornemisza of the C.S.I.R.O., Australia.

Professor J.A. Groenewald, of the Transvaal Regions, attended the annual meeting of the Standing Committee for Animal Production of SARCCUS in Swaziland.

Dr F.J. Kok, Deputy Director of the Highveld Region, and Dr E. Terbalnche, of the Eastern Cape Region, spent two weeks studying extension services in Rhodesia.

Mr C.J. Hunlun, of the Division of Plant and Seed Control, visited Lesotho to give advice in connection with potato trials.

Professor S.A. Hulme, Chief Director of Agronomy and Pastures, Dr A.J. Pienaar, Director of the Agronomy and Pastures Institute, and Messrs E.D. de Wet, J.J. van der Merwe and P.F. Clarke visited Mozambique and Swaziland in connection with rice and cotton trials.

Dr P.R. Mansvelt, Dr J.P. van der Merwe and Dr P.P. Bosman attended the meeting of the SARCCUS Standing Committee for Animal Health in Swaziland, and Dr J.H. Hofmeyr attended the meeting of the SARCCUS Standing Committee for Animal Production, also in Swaziland.

Dr P.R. Mansvelt and Dr E.B. Kluge, to the International Tsetse Fly Meeting in Angola.

The annual meeting of SARCCUS's Standing Committee for Plant Production in Angola was attended by Dr A.J. Pienaar, Director of the Agronomy and Pastures Research Institute. The meeting of the Standing Committee for Plant Protection was held at the same time and was attended by Dr I.H. Wiese, Director of the Plant Protection Research Institute.

Professor P.J. Burger, of the University of Pretoria, attended the annual meeting of SARCCUS's Standing Committee for Education and Extension in Malawi.

Dr W.G.H. Coaton, of the Plant Protection Research Institute, carried out termite surveys in Rhodesia.

At the invitation of the Swaziland authorities Dr H.T. Brodrick and Mr G.C. Green, of the Citrus and Subtropical Fruit Research Institute, visited Swaziland to investigate a root disease in citrus orchards.

The congress of the S.A. Society for Animal Production in Rhodesia was attended by eleven officers of the Department.

Mr I.G. Venter, of the Division of Plant and Seed Control, twice visited Mozambique to carry out surveys on the red locust position in that country. Subsequently Dr H.D. Brown and Mr G.L. Prinsloo visited Mozambique to carry out a survey in the pests build-up area.

Co-operation with Overseas Countries

Visiting scientists

A number of agricultural scientists visited the Republic during the year under review. Among them were the following persons:

Messrs A. Behman and M. Vakilzadeh, agriculturists from Iran, to study livestock projects and agricultural problems relating to soil and water conservation.

Mr J. Boyd, an extension officer from the Department of Primary Industries, Australia, to discuss extension matters.

Mr J.M. Brun, Assistant Director of the Sheep and Wool Research Station, Bariloche, Argentina, to collect information on the planning of research programmes.

Merssrs R. Brun and Y. Dalle, from France, to investigate the possibilities of growing agricultural products under plastic in South African conditions.

Dr D. Gaff, from Australia, to do research on the physiology of water losses in drought-resistant plants.

Dr Barry Gorman, of the Queensland Institute of Medical Research, to do research on bluetongue.

Dr J. Hackbarth, of the Max Planck Institute in West Germany, to give advice on the cultivation of lupins.

Mr Y. Arev, of the Department of Agriculture of Israel, to conduct saltbush studies in the Karoo Region.

Dr J. Shalhevet, Head of the Institute for Soil and Water, Volcani Agricultural Research Station, Israel, to lecture on irrigation.

A mission of four experts from Taiwan, headed by Dr Sun Ming-hsien (two visits), to investigate maize diseases and pests and maize exports to Taiwan.

Professor V. Westhoff, of the University of Nijmegen, Holland, to hold discussions on plant-ecological problems.

Mr M. Tell, the Economic Adviser to King Hussein, and Mr O. Abdulla, the Chairman of the Jordan River Commission, to determine in what way South Africa could be of assistance to Jordan, mainly as regards irrigation and dryland farming projects.

Mr W. Coachley, Senior Virological Technologist of the Department of Agriculture, Western Australia, to collect information on bluetongue and horsesickness.

Mr J. Coombe, Secretary (Personnel) of the C.S.I.R.O., Australia, to gain first-hand information on the classification and qualification structure of typical workers in scientific laboratories, as well as on methods and techniques of evaluating research staff.

Dr J. Crosse, the world-famous bacteriologist from the East Malling Research Institute in England, to test bacteriological techniques and give advice on the planning of future research at the Fruit and Fruit Technology Research Institute.

A mission of representatives from the wine committees of France, Italy and Britain, to discuss problems relating to naming wines according to origin, and quality control.

An Italian mission consisting of Professor Z. Bellani, the Director of Veterinary Services in Italy, Professor P. Savi, Dr F. Bucalo and Dr V. Barbabella, to investigate the export of fresh and frozen beef to Italy.

Dr J.W. Macaulay, of the Institute of Medical and Veterinary Science, Adelaide, Australia, to investigate the control of brucellosis.

Professor C.W. McCoy, an entomologist at the University of Florida, U.S.A., to collect information on pests common to America and South Africa.

Mr W.F.Y. Mawson, Development and Planning Officer, Department of Primary Industries, Brisbane, Australia, to investigate the administrative aspects of the control of pasture areas, and of the vegetation in arid and semi-arid areas.

Mr J.V. Possingham, Head of the Division of Horticultural Research, C.S.I.R.O., Adelaide, Australia, to gain information on research at the four Departmental horticultural institutes.

Dr Noel G. Smith, Senior Lecturer in Plant Physiology and Horticulture, University of New England, Australia, to collect information on research at the four horticultural institutes.

Dr J. Walker, of the C.S.I.R.O. Woodland Ecology Research Unit in Australia, to inspect agricultural projects in the Northern Transvaal Bushveld.

Dr P.S. Nutman, of the Department of Soil

Microbiology at the Rothamstead Research Station, England, to study legumes.

Three senior West German officials, Drs Geissler, Wegner and Orlop, to investigate the export of fresh and processed meat to Germany.

A French mission consisting of Messrs B. Vissac, Director of the Station for Animal Breeding and Genetics of the National Institute for Agricultural Research of France, M. Rondeau, Director of the Livestock Development Unit and the A.I. Stations of South-Western France, and M. Agan, Deputy Director, Stock Improvement Schemes of the Technical Institute for the Study of Large Stock, on the launching of a project for the development of a beef herd in Réunion.

Messrs G. Wright and J.E. Morris, senior British veterinarians, to investigate the export of meat to the United Kingdom.

International Organisations

The Department is represented on a large number of international organisations. The following are some of the organisations in whose activities it participated during the year under review:

International Standards Organisation (I.S.O.)

The South African Bureau of Standards, which is the co-ordinating body for the I.S.O. in the Republic, referred numerous proposals by the subcommittees to the Department for comment during the year.

International Council of Scientific Unions (I.C.S.U.)

The Department participates in the International Biological Programme (I.B.P.) of this Council. The C.S.I.R. acts as the liaison body and arranges for the Republic's representation on the Council.

International Seed Testing Association (I.S.T.A.)

Mr J.F. van Wyk, Director of the Division of Plant and Seed Control, attended the I.S.T.A.'s meeting in Denmark in June 1973 in his capacity as member of the executive committee.

International Scheme for the Certification of Forage Crop Seed

Mr J.F. van Wyk, Director of the Division of Plant and Seed Control, attended the annual meeting of this organisation in Paris in October 1972, and then visited South Africa's representatives of this Scheme in France, Belgium and West Germany.

International Dairy Federation (I.D.F.)

Mr P.J. Jooste, of the Animal and Dairy Science Research Institute, attended the annual meeting of the Federation in Japan in August 1972.

International Wine Office (O.I.V.)

Dr J.G. Boyazoglu, Agricultural Counsellor in Paris, who is South Africa's permanent representative in the O.I.V., attended the 52nd general meeting of this body in Budapest in September 1972.

Dr J.A. van Zyl and Dr C.S. du Plessis, of the Oenological and Viticultural Research Institute, attended various meetings of working parties and subcommittees of the O.I.V. in France in May 1973, as well as a special meeting for the election of a new director of the organisation.

International Atomic Energy Agency (I.A.E.A.)

An international food irradiation project, which will last five years and terminate at the end of 1973, was undertaken under the aegis of the I.A.E.A. and the E.N.E.A. (European Nuclear Energy Agency) and the F.A.O. Together with several other countries, South Africa is participating in the project and is contributing over R4 000 a year, including the Atomic Energy Board's contribution.

Several technical and other reports on the project have already appeared.

International Office of Epizootic Diseases (O.I.E.)

Dr P.R. Mansvelt, Director of Veterinary Services, attended the annual congress of the O.I.E. on animal health in Paris in May 1973.

Agricultural Counsellor, London

Dr J.P. Botha is the incumbent of this post and his function is chiefly to supply information to the Republic on agricultural developments in the United Kingdom, the Republic of Ireland and the Scandinavian countries, and to act as a liaison officer between agricultural organisations in those countries and in South Africa. He also serves on the Executive Council of the International Society for Horticultural Science, of which South Africa is a member.

Agricultural Counsellor, Washington

This post has been held by Dr P. Hildyard since March 1972. His duties are more or less the same as those of the Agricultural Counsellor, London.

Agricultural Counsellor, Paris

The incumbent of this post is Dr J.G. Boyazoglu, assisted by Messrs J.A. Thomas and W.P. Burger, Agricultural Attachés, by Miss H. Gevers, Administrative Officer, and by clerical staff.

In addition to France, Dr Boyazoglu's area of activity includes five other Common Market countries, viz West Germany, Italy, the Netherlands, Belgium and Luxembourg, as well as Spain, Portugal, Switzerland, Austria and Greece. Dr Boyazoglu's duties are basically the same as those of other agricultural counsellors, except that the Agricultural Counsellor in Paris plays a very important part acting as liaison between the various international organisations which have their headquarters in Europe and of which South Africa is a member. He is, among other things, South Africa's authorised permanent representative on the Secretariat of the International Food Irradiation Project and also represents the Republic in the International Wine Office.

Agricultural Counsellor, Buenos Aires

The incumbent of this post is Mr J.C.D. Retief, and his functions correspond to those of the other agricultural counsellors.

ADMINISTRATIVE MATTERS

The Establishment

Posts

The following table shows the number of posts in the Department (under the separate Divisions into which posts in the Public Service are divided) at 30 June 1973, and indicates the number of vacancies in each Division, as against the corresponding period of the previous year:

	30.6.1972			30.6.1973		
Division	Authorised posts	Posts vacant		Authorised posts	Posts vacant	
		Number	%		Number	%
Administrative	135	5	3,7	145	12	8,3
Clerical	465	25	5,4	475	63	13,3
Professional	1 715	182	10,6	1 691	228	13,5
Technical	1 534	125	8,1	1 544	173	11,2
General A	86	4	4,7	86	7	8,1
General B	2 296	287	12,5	2 221	248	11,2
Non-classified (including Coloured and Bantu posts)	323	44	13,6	286	21	7,3
Posts additional to the authorised establishment	53	5	9,4	76	7	9,2
Total	6 607	677	10,2	6 524	759	11,6

Increase in the number of authorised posts in the various categories over the past 5 years

Division	30/6/69	30/6/70	30/6/71	30/6/72	30/6/73	Total % increase or decrease
Administrative	118	123	132	135	145	+12,3
Clerical	500	471	468	465	475	– 5 *
Professional	1 721	1 746	1 719	1 715	1 691	– 1,7*
Technical	1 480	1 559	1 550	1 534	1 544	+10,4
General A	96	88	87	86	86	–10,4*
General B	2 238	2 277	2 239	2 296	2 221	– 0,7*
Non-classified	329	355	326	323	286	–13,1*
Total	6 482	6 619	6 521	6 554	6 448	– 0,5

N.B.: Non-classified posts do not include posts additional to the establishment

*Note: The drop in the number of approved posts may be ascribed to the annual drop in vacancies in the entry grade as a result of the economy measures laid down by the Cabinet, the re-allocation of services to other bodies, and the application of production control techniques.

General

In continuation of the Government's efforts to cut back Government expenditure, the following measures aimed at curbing expansion of the establishment, stabilising the staff position and increasing manpower utilisation were put into operation on 1 April 1973:

(a) The percentage of vacancies in the entry grades of the Department's establishment was reduced to 5 per cent on 1 April 1973.

(b) Except in urgent and essential cases, organisational and establishment inspections by the Inspectorate have been indefinitely suspended.

(c) The Division of Efficiency is continuing with the intensive application of techniques of short-term control aimed at abolishing unnecessary posts and at the better utilisation of staff.

(d) No funds for ordinary establishment expansion were voted for the 1973/74 financial year.

Establishment inspections

Inspection reports on the following institutions were implemented during the year under review:

Administration Branch – Division of Data Processing
Administration Branch – Division of Finance, Internal Control and Directives

Important organisational and establishment changes

Owing to the take-over of the **abattoirs** in Pietermaritzburg and Sandton by the Abattoir Commission from the local municipalities concerned on 1 November 1972, provision was made on the establishment of the Division of Veterinary Services for the meat inspection services prescribed under the Animal Slaughter, Meat and Animal Products Hygiene Act, 1967.

The designation of the Division of Work Study in the Administration Branch was changed to the **Division of Efficiency** with effect from 1 February 1973. The organisation of the Division was also changed to make provision for two subdivisions, viz Work Study and Production Control.

In order to strengthen the Republic's ties with Australia and New Zealand, a post of **Agricultural Attaché (Technical)**, headquarters Canberra, was created on the establishment of the Department with effect from 1 March 1973.

In accordance with the Government's economy drive, 153 vacant posts in the entry grades in the Professional, Technical, Clerical, General and Non-classified Divisions on the Department's establishment were abolished with effect from 1 April 1973.

In accordance with a Government decision, the various **faculties of agriculture** and the Faculty of Veterinary Science were placed under the control of the Universities of Pretoria, Natal, the Orange Free State and Stellenbosch on 1 April 1973. Owing to the rationalisation problems being experienced by the universities concerned, however, it was decided that the teaching and technical staff attached to the faculties of agriculture should be seconded to the universities up to 31 December 1973, after which their transfer will take full effect.

Staff gains and losses

	1.7.1971 – 30.6.1972			1.7.1972 – 30.6.1973		
Division	**ϕ Gains**	**Losses***	**%**	**ϕ Gains**	**Losses***	**%**
Administrative	7	11	–57,1	5	12	–140
Clerical	166	162	+ 2,4	149	174	– 16,8
Professional	187	195	– 4,3	132	206	– 56,1
Technical	264	250	+ 5,3	175	233	– 33,1
General A	26	23	+11,5	15	17	– 13,3
General B	688	737	– 7,1	612	685	– 12,0
Non-classified	66	86	–30,3	53	56	– 5,7
Total	1 404	1 464	– 4,2	1 141	1 383	– 21,2

ϕ By "Gains" is meant all persons gained by every Division, i.e. appointments from outside, promotions and translations from one Division to another, and transfers from other Departments

* By "Losses" is meant all persons lost by the various Divisions (individually and jointly), including translations and promotions to other Divisions and cases where persons left the service for good, for instance resignations, deaths, retirements, abscondences and dismissals

The veterinary services in the Bantu homelands of KwaZulu, Lebowa, the Ciskei, Bophuthatswana, Venda and Machangana were transferred to the homeland governments concerned, together with the Bantu stock inspection staff allocated, with effect from 1 April 1973.

Following representations from the Horticultural Research Institute, permission was granted for the establishment of a **vegetable research unit** in the Eastern Cape Region, with Addo as the research centre. The removal of protea research from Oude Bosch to Tygerhoek as from 1 April 1973 was also approved.

New extension offices on the establishment of the Winter Rainfall Region were opened at Ceres, Robertson and Joubertina.

The extension service of the Highveld Region was reorganised on 1 April 1973 in order to make provision for a seventh subregion. The seven subregions are now those of Lichtenburg, Potchefstroom, Heidelberg, Kroonstad, Bothaville, Harrismith and Bethlehem.

Staff changes (senior staff)

Retirements

The following senior officers retired from the service of the Department after a long career, on reaching the age limit:

Name	Rank	Institution to which attached	Years of service	Date of leaving the Service
Mr J.A. Booyens	Senior Deputy Secretary (Administrative)	Head Office	43 years	30 September 1972
Dr C.E.M. Tidmarsh	Chief Director	Head Office	33 years	31 December 1972
Mr F.J. Rosenstrauch	Director	Division of Agricultural Information	44 years	31 August 1972
Mr E.H.W. Lochner	Director	Division of Plant Pest Control	25 years	31 August 1972
Mr E.J.J. van der Horst	Director	Division of Soil Protection	38 years	30 June 1973
Mr J.J.S. Cilliers	Deputy Director	Karoo Region	37 years	31 December 1972
Mr A.N. Redelinghuys	Chief Accountant	Head Office	45 years	31 August 1972
Dr L.W. Rossiter	Assistant Director	Division of Veterinary Services	40 years	30 November 1972
Dr J.M. de Wet	Assistant Director	Division of Veterinary Services	35 years	31 December 1972
Mr H.A.F. Lea	Assistant Director	Plant Protection Research Institute	42 years	30 November 1972

Promotions

Name	Rank to which promoted	Institution	Date promotion became effective
Mr C.B. Balt	Senior Deputy Secretary	Head Office – Management	1 October 1972
Mr B.W. Viljoen	Deputy Secretary	Administration Branch	1 October 1972
Mr P.B. de Klerk	Chief Accountant	Administration Branch	1 September 1972
Mr H.F. van Zyl	Under Secretary	Administration Branch	1 October 1972
Mr M.D. Meyer	Assistant Director (Administrative)	Veterinary Services Branch	1 April 1973
Mr D.B. Marais	Director	Division of Agricultural Information	1 September 1972
Dr J. Serfontein	Director	Division of Soil Protection	1 June 1973
Mr R.W. Nott	Deputy Director (Extension)	Highveld Region	1 January 1973
Dr P.F. Fuls	Deputy Director	Soil and Irrigation Research Institute	1 June 1973
Mr H.S. Niehaus	Deputy Director	Division of Soil Protection	1 January 1973
Dr P. de la Harpe	Assistant Director	Division of Veterinary Services	1 July 1972
Dr W.J. Pienaar	Assistant Director	Fruit and Fruit Technology Research Institute	1 October 1972
Mr Q. Momberg	Assistant Director	Division of Agricultural Information	1 October 1972

Promotions

Name	**Rank to which promoted**	**Institution**	**Date promotion became effective**
Dr D.M. Scotney	Assistant Director (Extension)	Natal Region	1 January 1973
Dr C. Van N. Jonker	Assistant Director	Division of Veterinary Services	1 December 1972
Dr J.G. Pienaar	Assistant Director	Veterinary Science Research Institute	1 January 1973
Dr L.J.F. von Maltitz	Assistant Director	Division of Veterinary Services	1 January 1973

Bursaries

The bursary scheme administered by the Department with funds donated by the various control boards was continued during 1972/1973. Bursaries are awarded for the full study period which may vary from one to five years. The following table shows the number of bursaries granted since 1962, as well as their monetary value:

	Number of bursaries		**Studies completed**	**Total monetary value of new bursaries granted**
	New grants	**Total**		
Grants up to 1962	–	75	–	R100 200
Grants up to 1963	29	93	31	42 400
Grants up to 1964	46	108	32	47 400
Grants up to 1965	38	107	27	45 800
Grants up to 1966	51	131	40	55 800
Grants up to 1967	45	141	35	52 000
Grants up to 1968	55	161	33	80 650
Grants up to 1969	29	157	31	40 200
Grants up to 1970	27	153	44	56 400
Grants up to 1971	29	138	23	61 600
Grants up to 1972	34	149	25	59 200
Grants up to 1973	46	170	32	98 200

This table includes bursaries granted for post-graduate study at local universities up to and including 1973. During 1973 four bursaries to the value of R4 000 were awarded for post-graduate study at local universities.

The following table shows the number of officers released from service for post-graduate study at local universities since 1959:

Year	**1959–1962**	**1963**	**1964**	**1965**	**1966**	**1967**	**1968**	**1969**	**1970**	**1971**	**1972**	**1973**
B. Agric. (Hons) (Inst. Agrar.)	–	–	–	–	21	14	16	11	8	8	14	12
Master's degree	88	52	145	111	149	70	35	25	37	47	40	39
Doctorate	–	–	1	2	6	5	1	–	–	–	–	1

As regards advanced scientific training, a number of promising officers are studying overseas. The number of officers sent overseas for post-graduate study is still dropping.

The following table shows the number of officers who have already completed their overseas studies or will complete them shortly:

Year	**1963**	**1964**	**1965**	**1966**	**1967**	**1968**	**1969**	**1970**	**1971**	**1972**	**1973**	**1974**
Number	26	19	21	12	14	4	15	3	4	4	5	5

A sum of R5 000 was granted to 20 needy students following the diploma course at the various colleges of agriculture.

Training of agricultural technicians

The training of learner technicians was transferred to the Pretoria College for Advanced Technical Education as from 4 July 1972. An induction course was arranged for the first-year learner technicians during the first semester of 1973.

10. Annexures

(1) ORGANISATION AND FUNCTION OF THE DEPARTMENT

(a) HEAD OFFICE OF THE DEPARTMENT

Agriculture Building, cr. Beatrix Street and Soutpansberg Road, Private Bag X116, Pretoria

Overhead Administrative Control

Secretary – Dr W.A. Verbeek
Senior Deputy Secretary (Professional) – Mr W. van der Merwe
Senior Deputy Secretary (Administrative) – Mr C.B. Balt
Deputy Secretary (Personnel and General) – Mr J.S. Pretorius
Deputy Secretary (Technical and Legal Affairs) – Mr B.W. Viljoen
Under-Secretary (Sundry) – Mr R.W. Colenbrander
Under-Secretary (Personnel Administration) – Mr A.J. Schoonwinkel
Chief Work Study Officer – Mr G.P. Kleinhans
Under-Secretary (Data Processing) – Mr G.J. Smit (from 1.8.73)
Under-Secretary (Technical Administration) – Mr H.F. van Zyl
Under-Secretary (Statutory Control) – Mr C.J. Wessels
Under-Secretary (Acts and Parliamentary) – Mr C.S. de Villiers (from 1.8.73)
Under-Secretary (External Affairs) – Mr L.J. Botha
Chief Accountant – Mr P.B. de Klerk
Assistant Chief Accountant – Mr P.L. Joubert

Directorate of Agricultural Technical Services

Chief Director (Crops and Pastures) – Prof S.A. Hulme
Chief Director (Farm and Resources Development) – Dr D.W. Immelman
Chief Director (Horticulture) – Dr J.C. Strydom
Chief Director (Animal and Dairy Science) – Dr C.M. van Wyk
Chief Director (Extension and Education) – Mr S.W. Walters

Veterinary Services Branch

Chief Director (Veterinary Services) – Dr B.C. Jansen
Assistant Director (Administrative) – Mr M.D. Meyer (Transvaal Agricultural Union Building, 281 Struben Street, Pretoria)

Panel Professional Auxiliary Service's

Director – Professor D.M. Joubert
Deputy Director (Biometry) – Vacant
Assistant Director (Biometry) – Dr J.P. Jooste
Assistant Director (Training) – Vacant
Assistant Directors (General Auxiliary Services): Mr P.F.H. Clarke, Mr J.G. Low and Dr H.L. Pearse

Crops and Pastures Institute

Director – Professor A.J. Pienaar
Deputy Director – Mr D.F. de Wet
Assistant Directors: Dr D.J. Rossouw, Mr T.E. Skinner and Mr J.H. Preller

The Institute does not itself engage in research but gives guidance to research workers engaged in research in the different regions on summer grain, winter grain, other agricultural crops, pastures and pasture crops, and co-ordinates all research in this connection. The coordination of weed and poisonous plants research at the national level, as well as supplying technical information in connection with weedicides, is also a function of the Institute

Departmental Inspectorate

Departmental Inspector (Professional) – Mr H.J. Kriek
Departmental Inspector (Professional) – Vacant

(b) FOREIGN REPRESENTATIVES

Agricultural Attaché (London) – Dr J.P. Botha (Agricultural Counsellor) (South African Embassy, South Africa House, Trafalgar Square, London W.C. 2N5DP, England)
Agricultural Attaché (Paris) – Dr J.G. Boyazoglu (Agricultural Counsellor) (South African Embassy, 51 Ave Hoché, Paris 8e, France)
Agricultural Attaché (Washington) – Dr P. Hildyard (Agricultural Counsellor) (South African Embassy, 3051 Massachusetts Avenue, Washington D.C. 20008, U.S.A.)
Agricultural Attaché (Buenos Aires) – Mr J.C.D. Retief (South African Embassy, Cerrito 550-6^{o} Piso, Buenos Aires, Argentina)

(c) RESEARCH INSTITUTES

Soil and Irrigation Research Institute,
Belvedere Street, Private Bag X79, Pretoria

Director – Dr M.C.F. du Plessis
Deputy Director (Chemical Analysis and Regulatory Services) – Dr P.F. Fuls
Deputy Director (Irrigation Research, Agricultural Meteorology and Agricultural Land Development) – Dr A.D. Nieuwoudt
Assistant Directors: (Chemical analysis and Regulatory Services) – Dr C.E.G. Schutte; (Soil Survey) Dr C.N. Macvicar; (Irrigation Research) – Vacant; (Agricultural Meteorology) – Dr M.E.L. Buys; (Agricultural Land Development) – Mr J. Myburgh

The Institute is responsible for the classification and mapping of the soils of the Republic, as well as for basic research at national level in respect of the physical and chemical characterisitics of soils. In addition, soil surveys are undertaken for irrigation projects and the investigation of physical soil characteristics where brack and waterlogging conditions occur. The Institute, on behalf of other Government departments, provincial administrations and other bodies, also undertakes the chemical analysis of soil, water and plant material. Furthermore, the Institute, in terms of Act 36 of 1947, undertakes the inspection and analysis of fertilisers, stock feeds, stock remedies and agricultural remedies. The Institute is responsible for the planning, co-ordination and control of irrigation research carried out by and/or in co-operation with the Regions and Institutes and has also been designated to undertake agricultural evaluations and planning of irrigation areas. Another task of the Institute is the collection, processing and interpretation of meteorological data for agricultural purposes.

Plant Protection Research Institute,
Agriculture Building, Beatrix Street,
Private Bag X134, Pretoria

Director – Dr I.H. Wiese
Deputy Director – Dr J.J. du Toit (Director)
Assistant Director (Entomology/Zoology) – Dr D.P. Annecke
Assistant Director (Combating of Locusts) – Vacant
Assistant Director (Phytosanitary Services) – Vacant
Assistant Director (Plant Pathology/Microbiology) – Dr B.W. Strydom

The Institute is broadly responsible for advanced research and research at the national level on plant pathology, insect and animal pests and their control. This includes microbiology, taxonomy of fungi, identification of virus diseases, the freeing of propagating material from viruses, honey-bees, insects in stored grain, forest and timber insects, taxonomy of insects and nematodes, economic zoology, toxicology of insecticides and the biological control of insect pests and weeds. The Institute is also responsible for the examination and control of imported plant material and the control of migratory locusts. The Institute uses the research stations and experimental farms at Rietondale (Pretoria), Buffelspoort (Marikana), Fleurbaix and the quarantine station (Stellenbosch), as well as the research units for the control of prickly pear and jointed cactus at Uitenhage and forest pests at Rosebank (Cape Town).

Botanical Research Institute,
Private Bag X101, Pretoria

Director – Dr L.E.W. Codd
Deputy Director – Dr B. de Winter
Assistant Director – Dr D.J.B. Killick

The Institute undertakes basic research on the flora and vegetation of South Africa with emphasis on taxonomy, morphology, ecology and economic botany. The Institute also controls the Botanical Garden at Brummeria (Pretoria) and herbaria in Durban, Grahamstown, Kimberley, Pretoria, Stellenbosch and Windhoek.

Citrus and Subtropical Fruit Research Institute,
Private Bag 11208, Nelspruit

Director – Dr J.H. Grobler
Deputy Director – Mr A. van Oostrum
Assistant Director – Dr D.L. Milne

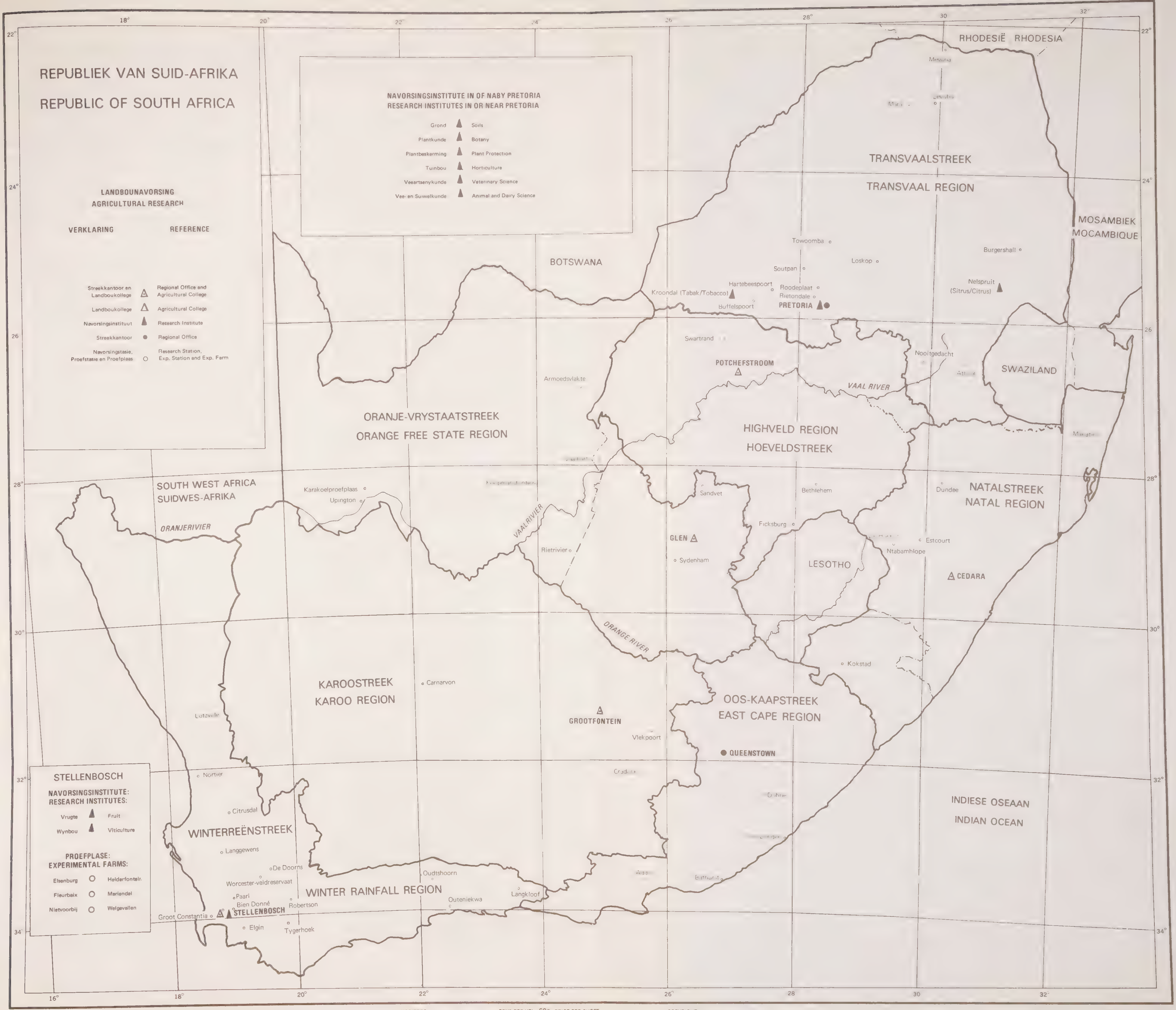
The Institute is responsible for country-wide research on all aspects of the citrus and subtropical fruit industry, as well as nuts, tea, coffee and herbs.

The Institute also undertakes research on the research stations and experimental farms Addo (Eastern Cape), Burgers Hall, Citrusdal, East London Friedenheim, Levubu (Louis Trichardt), Messina, and Rustenburg.

Tobacco Research Institute (Kroondal),
Private Bag, Rustenburg

Director – Mr J.F. Peens
Deputy Director – Mr H.G. Snyman (Assistant Director)
Assistant Director – Dr M.P. Lambrecht

The Institute is responsible for reserach, including technological aspects, in the interests of the


REPUBLIEK VAN SUID-AFRIKA
REPUBLIC OF SOUTH AFRICA
LANDBOUNAVORSING
AGRICULTURAL RESEARCH
VERKLARING
REFERENCE
Streekkantoor en Landboukollege
Regional Office and Agricultural College
Landboukollege
Agricultural College
Navorsingsinstituut
Research Institute
Streekkantoor
Regional Office
Navorsingstasie, Proefstasie en Proefplaas
Research Station, Exp. Station and Exp. Farm
NAVORSINGSINSTITUTE IN OF NABY PRETORIA
RESEARCH INSTITUTES IN OR NEAR PRETORIA
Grond
Soils
Plantkunde
Botany
Plantbeskerming
Plant Protection
Tuinbou
Horticulture
Veeartsenykunde
Veterinary Science
Vee- en Suiwelkunde
Animal and Dairy Science
STELLENBOSCH
NAVORSINGSINSTITUTE:
RESEARCH INSTITUTES:
Vrugte
Fruit
Wynbou
Viticulture
PROEFPLASE:
EXPERIMENTAL FARMS:
Elsenburg
Helderfontein
Fleurbaix
Mariendal
Nietvoorbij
Welgevallen
RHODESIË RHODESIA
Messina
Levubu
Mara
TRANSVAALSTREEK
TRANSVAAL REGION
MOSAMBIEK
MOCAMBIQUE
BOTSWANA
Towoomba
Loskop
Burgershall
Soutpan
Hartebeespoort
Kroondal (Tabak/Tobacco)
Roodeplaat
Rietondale
Buffelspoort
PRETORIA
Nelspruit
(Sitrus/Citrus)
Swartrand
POTCHEFSTROOM
Nooitgedacht
SWAZILAND
VAAL RIVER
Armoedsvlakte
ORANJE-VRYSTAATSTREEK
ORANGE FREE STATE REGION
HIGHVELD REGION
HOEVELDSTREEK
SOUTH WEST AFRICA
SUIDWES-AFRIKA
Karakoelproefplaas
Upington
ORANJERIVIER
VAALRIVIER
Sandvet
Bethlehem
Dundee
NATALSTREEK
NATAL REGION
Ficksburg
GLEN
Rietrivier
Sydenham
Estcourt
Ntabamhlope
LESOTHO
CEDARA
ORANGE RIVER
Kokstad
KAROOSTREEK
KAROO REGION
Carnarvon
OOS-KAAPSTREEK
EAST CAPE REGION
Lutzville
GROOTFONTEIN
Vlekpoort
QUEENSTOWN
Cradock
Dohne
INDIESE OSEAAN
INDIAN OCEAN
Bathurst
Nortier
Citrusdal
WINTERREËNSTREEK
Langgewens
De Doorns
Worcester-veldreservaat
Oudtshoorn
WINTER RAINFALL REGION
Paarl
Bien Donné
Robertson
Langkloof
Outeniekwa
Groot Constantia
STELLENBOSCH
Elgin
Tygerhoek
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tobacco industry in all parts of the country. The Institute also undertakes research work on research stations and experimental plots at Groblersdal, Hartebeespoort (Brits), Nelspruit, Oudtshoorn, Potgietersrus and Stellenbosch

Horticultural Research Institute (Roodeplaat),
Private Bag X293, Pretoria

Director – Mr E. Strydom
Deputy Director – Dr J.T. Meynhardt
Assistant Director – Mr T.G. la G. Joubert

The Institute is responsible for all applied and fundamental research and extension on vegetables, cut flowers, ornamental plants and shrubs throughout the whole of South Africa and on deciduous fruit and table grapes in the summer rainfall areas. The Institute controls the research stations for vegetables at Roodeplaat in the Transvaal Middle Veld and for cherry and deciduous fruit at Emperani, near Ficksburg. In addition the Institute undertakes research on vegetables in the winter rainfall area at Elsenburg, Outeniqua and Lutzville, as well as at Glen in the Orange Free State, at Nelspruit in the Transvaal Lowveld and at Cedara in Natal. Research on indigenous flowers, mainly protea, is undertaken at the Tygerhoek Research Station near Riviersonderend.

Veterinary Research Institute,
Onderstepoort, Pretoria

Director – Dr K.E. Weiss
Deputy Directors:
  (Virus Diseases, Bacterial and Protozoic Diseases, Parasitology and Chemistry) – Dr M. de Lange
  (Pathology, propagation, and Professional Technical Auxiliary Services) – Dr J.D. Smit

Assistant Directors:
  (Protozoology and Parasitology) – Dr R.D. Bigalke
  (Bacteriology and Diagnostics) – Dr T.F. Adelaar
  (Virus Diseases and Molecular Biology) – Dr D.W. Verwoerd
  (Toxicology and Technical Adviser, Act 36 of 1947) – Dr T.W. Naudé
  (Chemistry) – Dr R. Oellermann
  (Pathology) – Dr J.G. Pienaar

The Institute is concerned with research on diseases of stock and wild game (infectious and others, including diseases caused by malnutrition), diagnostics, the preparation of vaccines and diagnostic aids, and the biological evaluation of dips and remedies submitted for registration.

Animal and Dairy Science Research Institute,
Poynton Building, West Block, 9th Floor, Church Street,
Private Bag X177, Pretoria

Director – Dr J.H. Hofmeyr
Deputy Director (Livestock Improvement, Animal Physiology and Nutrition, and Poultry Science) – Dr G.B. Laurence (Assistant Director)
Deputy Director (Dairy Science) – Dr J.C. Oosthuisen
Assistant Directors:
  (Livestock Improvement) – Mr J.S.A. Landrey
  (Animal Physiology and Nutrition) – Dr J.G. Cloete
  (Poultry Science) – Mr W.J.C. Viljoen
  (Dairy Science) – Dr J.H. Labuschagne

The Institute, at various centres throughout the country, undertakes at the natural level performance and progeny testing as well as fundamental research on the breeding, feeding and physiology of farm animals. The Institute is also responsible for dairy and poultry research on a country-wide basis as well as for the training of dairy technologists at Glen. The Institute has at its disposal a main research station at Irene, undertakes poultry research at Potchefstroom, Elsenburg, the University Experimental Farm at Pretoria and Cedara, and controls random testing of poultry at Irene and Glen as well as pig testing stations at Irene, Cedara and Elsenburg, and bull testing stations at Queenstown and Omatjenne (South West Africa)

Fruit and Fruit Technology Research Institute,
Private Bag, Stellenbosch, C.P.

Director – Dr P.G. Marais
Deputy Director – Dr A.J. Heyns
Assistant Directors:
  (Table Grapes, Horticulture, Plant Improvement, Plant Pathology and Entomology) – Dr A.C. Myburgh;
  (Chemistry, Cold Storage, Plant Biochemistry, Fruit Processing, Radio Isotopes) – Dr W.J. Pienaar

The Institute is responsible for research on deciduous fruits, table grapes and certain aspects of proteas in the winter rainfall area, as well as for research at national level in connection with certain technological aspects of fruits and other agricultural products assigned to it. The Institute further renders a radiation and radio-isotopic service in connection with agricultural problems in the winter rainfall complex.

The Institue controls the research stations and experimental farms at Groot Drakenstein (Bien Donné), Citrusdal, De Doorns, Elgin, Langkloof, Oudebosch, Paarl and Robertson.

Oenological and Viticultural Research Institute,
Private Bag, Stellenbosch, C.P.

Director – Dr J.A. van Zyl
Deputy Director – Dr J. de V. Burger
Assistant Director – Mr M.S. le Roux

The Institute is responsible for all research in the sphere of oenology and viticulture for the winter rainfall area, and all viticultural research in the Lower Orange River area. For this purpose the Institute has at its disposal research stations at Stellenbosch (Nietvoorbij) and Robertson, as well as experimental vineyards at Upington and Lutzville. The Institute controls the historic wine farm Groot Constantia.

(d) DIVISIONS

Division of Soil Protection
Agriculture Building, Beatrix Street, Private
Bag X120, Pretoria

Director – Mr E.J.J. van der Horst
Deputy Director (Regulatory Control) – Dr J. Serfontein
Assistant Director (Land Subdivision and Weed Control) – Dr A.J. Siepker
Assistant Director (Administrative) – Mr B.J. Dreyer

The Division is responsible for the administration of the Soil Conservation Act (Act no. 76 of 1969), the Weeds Act (Act no. 42 of 1937), and the Subdivision of Agricultural Land Act (Act no. 70 of 1970). The Division also administers the following assistance schemes in terms of the Soil Conservation Act: the Financial Assistance Scheme, Flood Assistance Scheme, Stock Reduction Scheme, Veld Reclamation Scheme and Grass Ley Scheme.

Division of Agricultural Engineering,
Creswell Road, Koedoespoort, Private Bag X515,
Silverton, Tvl.

Director – Mr J.J. Bruwer
Chief Engineers:
(Regional Services and Soil Conservation) – Mr N.J. van Straaten
(Research Civil and Irrigation, Testing and Research Mechanical, and Utility Services) – Mr C.T. Crossby
Assistant Chief Engineers:
(Regional Engineering Services, Stellenbosch) – Mr J.F. la G. Matthee
(Soil Conservation Works, Pretoria) – Mr P.J. Pienaar
(Research Civil and Irrigation, Pretoria) – Mr I. Scheepers
(Testing and Research Mechanical, Pretoria) – Mr J. Veenstra

This Division has a specialised task and devotes itself to all engineering problems in the agricultural industry such as mechanisation, (farm power and machinery), soil conservation, water utilisation, farm structures, handling of material, storage of grain, cold storage and processing of fruit, vegetables and other assigned products, as well as all other engineering services with which the Department is concerned, such as the preparation and development of plots on irrigation schemes. In addition to providing construction, utility, expert extension, regulatory and testing services in the above connection, the Division also undertakes related research.

Division of Agricultural Information,
Agriculture Building, Beatrix Street,
Private Bag X144, Pretoria

Director – Mr D.B. Marais
Assistant Director (Information) – Mr R.J. van Niekerk, (Deputy Director)
Assistant Director (Publications) – Mr Q. Momberg

The function of the Division is the distribution of agricultural information by mass media. For this purpose use is made of scientific and popular agricultural publications, radio programmes, audiovisual aids and press releases. The Division is also responsible for the maintenance of an agricultural information bureau.

Division of Plant and Seed Control (from 1.7.1973)
Agriculture Building, Hamilton Street, Private Bag X179,
Pretoria

Director – Mr J.F. van Wyk
Deputy Director – Mr D.C. Lourens
Assistant Director (Quality Control) – Mr J.J. Lowes
Assistant Director (Inspection and Control Services – Vacant

The functions of this Division include the protection of propagation material and the assurance of its quality. The Division administers the Seeds Act (No. 28 of 1961), the Plant Breeders' Rights Act (No. 22 of 1964) and the Agricultural Pests Act (No. 3 of 1973)

Division of Veterinary Services,
Transvaal Agricultural Union Building, 281 Struben
Street, Private Bag X138, Pretoria

Director – Dr P.R. Mansvelt
Deputy Directors:
(Regulatory Services) – Dr J.P. van der Merwe (Pretoria)

(Health Services) – Dr J.H.B. Viljoen (Pretoria)
(Veterinary Services – South West Africa) – Dr T. Veenstra (Windhoek)

Assistant Directors:
(Animal Health, Non-notifiable Diseases and A.I. Services) – Dr P. de la Harpe (Pretoria)
(Diagnostic Services) – Dr G.C. van Drimmelen (Pretoria)
(Meat Hygiene and Related Matters) – Dr J.D. Coetzee (Pretoria)
(Import and Export Control and Border Control) Dr E.B. Kluge (Pretoria)
(Notifiable Diseases, Major Disease Eradication Schemes, Extension and Training) – Dr A. van Heerden (Pretoria)
(Bantu Veterinary Services) – Dr J.M. Erasmus (Pretoria)
(Highveld Region) – Dr P.P. Hugo (Potchefstroom)
(Natal Region) – Dr W.H.B. Bühr (Pietermaritzburg)
(Eastern Cape and Karoo Region) – Dr C.W.A. Belonje (East London)
(Eastern Transvaal Region) – Dr L.R. Hurter (Pietersburg)
(Transvaal Region) – Dr F.W.B. du Casse (Pretoria)
(Free State Region) – Dr T.A.T. Louw (Bloemfontein)
(Winter Rainfall Region) – Dr E.O. le Riche (Stellenbosch)
(S.W.A. North) – Dr C. van N. Jonker (Windhoek)
(S.W.A. South) – Dr L.J.F. von Maltitz (Windhoek)

The Assistant Directors of the Regions are under the direct control of the Director.

The Division has a specific task in regard to animal health as laid down in the Animal Diseases and Parasites Act, 1956 (Act 13 of 1956) and regulations promulgated in terms thereof.

The Division guards against the introduction of diseases by erecting, patrolling and maintaining game- and cattle-proof fences on the borders of the Republic and South West Africa and by controlling animal imports. For domestic protection regular inspections of all stock are carried out. The promotion of animal health schemes to eradicate certain diseases and animal health in general enjoy high priority.

Apart from the Central Veterinary Laboratory at Onderstepoort, the Division also has four Regional Veterinary Laboratories throughout the Republic and South West Africa for local investigation of stock losses, problems relating to animal health and sub-optimal production and reproduction.

In terms of the Animal Slaughter, Meat and Animal Products Hygiene Act, 1967 (Act 87 of 1967), the Division is responsible for the promotion and maintenance of hygiene in cattle slaughterings and handling of meat and animal products, for preventing the transmission of diseases to human beings and animals by disease-infected animals, meat or animal products, for preventing cruelty to animals slaughtered at abattoirs and for controlling the importation of meat.

(e) REGIONAL ORGANISATIONS

The eight Regional Organisations of the Republic, as well as of South West Africa, are responsible within their respective geographical areas, for the planning, development, promotion and application of farming systems based on optimal land utilisation.

Each of these organisations provides an extension service in which the soil conservation effort is integrated and which also covers every aspect of farming. The research services are directed to the collation and releasing of scientific knowledge for the optimal utilisation.

Each of these organisations provides an extension service in which the soil conservation effort is integrated and which also covers every aspect of farming. The research services are directed to the collation and releasing of scientific knowledge for the optimal utilisation of the natural agricultural resources. The research personnel are also responsible for specialist extension work and for supplying training services to the agricultural colleges.

Highveld Region,
Private Bag 804, Potchefstroom

Director – Dr D.J. Agenbach
Deputy Director (Research) – Dr W.P. Grobbelaar (Assistant Director)
Assistant Director (Research) – Mr J.D. Basson
Deputy Director (Estension) – Dr F.J. Kok
Assistant Director (Extension) – R.W. Nott

Research Stations and experimental farms: Potchefstroom complex (central research station), Bethlehem and Swartrand (for gousiekte research) at Ventersdorp.

Karoo Region,
Grootfontein Agricultural College, Middelburg, C.P.

Director – Dr W.J. Hugo
Deputy Director (Research) – Dr P.W. Roux
Assistant Director (Research) – Mr J.A.A. Baard
Deputy Director (Extension) – Mr C.R. Baard
Assistant Director (Extension) – Dr A.J. Siepker

(1.7.73) Grootfontein College of Agriculture
Research stations experimental farms: Grootfontein, Middelburg, C.P. (central research station), Carnarvon and Tarka Conservation Area.

Natal Region,
Private Bag 9021, Pietermaritzburg

Director – Mr L.C. Zeeman
Deputy Director (Research) – Dr G.O. Harwin
Assistant Director (Research) – Dr J.W.C. Mostert
Deputy Director (Extension) – Mr R.H. Peard
Assistant Director (Extension) – Dr D.M. Scotney
Assistant Director (Administrative) – Mr D.E. Foster
College – Cedara College of Agriculture
Research stations experimental farms: Cedara (Central Research Institute), Drakensberg Complex, Dundee, Kokstad and Makatini

Eastern Cape Region,
P.O. Box 233, Queenstown

Director – Mr L.F. Whitlock
Deputy Director (Research) – Mr J.H. Stapelberg
Assistant Director (Research) – Mr J.L. van der Walt
Deputy Director (Extension) – Mr H.S. Niehaus
Assistant Director (Extension) – Dr E. le F. Terblanche
Research stations: Döhne (central research station) at Stutterheim, and Bathurst (Port Alfred). A number of experiments are also conducted at East London.

Transvaal Region,
Agrivaal Building, cr. Edmund and Hamilton Streets, Private Bag X180, Pretoria

Director – Prof. F.R. Tomlinson
Deputy Director (Research) – Dr P.E. Lombard
Assistant Director (Research) – Mr J.J. van der Merwe
Deputy Director (Extension) – Mr E.C. Anderssen (Assistant Director)
Assistant Director (Extension) – Mr S.J. Gericke
Assistant Director (Administrative) – Mr T. Brenkman
Research stations experimental farms: Roodeplaat (central research station), Pretoria University Experimental Farm, Rietondale, Soutpan (Pretoria); Athole (Amsterdam), Loskop (Groblersdal), Mara (Louis Trichardt), Messina, Nooitgedacht (Ermelo), Sterkrivier (Potgietersrus) and Towoomba (Warm Baths).

Free State Region,
Agricultural College, Glen

Director – Dr S.W. Pienaar
Deputy Director (Research) – Mr W.S. Grobbelaar
Assistant Director (Research) – Dr P.J. Niemann
Deputy Director (Extension) – Dr J.D. Slabber
Assistant Director (Extension) – Mr C.W. Oosthuyzen
Assistant Director (Administrative) – Mr J.C. Jacobs
Glen College of Agriculture

Research stations experimental farms: Glen (central research station), Armoedsvlakte (Vryburg), Koopmansfontein (Barkly West), Rietrivier (Herbert), Sandvet, Sydenham, Upington Complex and Vaalharts (Jan Kempdorp)

Winter Rainfall Region,
J.S. Marais Building, Private Bag X5023, Stellenbosch

Director – Dr J.E. Erasmus
Deputy Director (Research) – Dr P.J.S. Pieterse
Assistant Director (Research) – Mr J.E. van Niekerk
Deputy Director (Extension) – Mr A. Viljoen
Assistant Director (Extension) – Mr D.J. van Z. Smit
Assistant Director (Administrative) – Mr H.C. du Preez
Stellenbosch-Elsenburg College of Agriculture
Research stations and experimental farms: Elsenburg, Mariendal and Welgevallen (Stellenbosch), Langgewens (Moorreesburg), Nortier (Lambert's Bay), Oudtshoorn, Outeniqua (George), Tygerhoek (Riviersonderend) and the Veld Reserve at Worcester.

South West Africa,
Private Bag X13184, Windhoek

Director – Mr D.J. Louw
Deputy Director (Research) – Mr L. Mostert
Deputy Director (Extension) – Mr J.H. Loubser
Neudam Agricultural College
Research stations experimental farms: Gellap 'Ost (Keetmanshoop), Hardap (Mariental), Kalahari (Stampriet), Neudam (Windhoek), Omatjenne (Otjivarongo), Sandveld (Gobabis), Sonop (Grootfontein) and Uitkomst (Grootfontein).

(2) FINANCES

(a) REVENUE (REPUBLIC)

		R	R	R
1.	Rentals from houses			426 161,19
2.	Interest			12 752,53
3.	Recoveries of loans			
4.	Departmental receipts			
	Administration and general			
	(a) Registration fees	69 518,12		
	(b) Commission on insurances	14 734,41	84 252,53	
	Vaccines		987 113,78	
	Goods and services		1 606 112,82	
	Publications		61 351,46	
5.	Miscellaneous revenue			
	(a) Refund on voted expenditure	114 535,96		
	(b) Sale of State property	119 846,14		
	(c) Unclaimed cash	19 845,05		
	(d) Miscellaneous	1 109 375,70		
	GRAND TOTAL		1 363 602,85	4 102 433,44
6.	Interest on Tobacco Research Account			18 955,84
7.	Interest on Wine Research Account			3 176,15
8.	Interest on Agricultural Research Account			3 151,83
	TOTAL REVENUE			4 566 630,98

(b) REVENUE (SOUTH WEST AFRICA)

		R	R
1.	Rentals from houses		
2.	Departmental receipts		
	Vaccines		
	Goods and services		241 343,92
	Publications		
3.	Miscellaneous revenue		
	TOTAL REVENUE		241 343,92

(c) EXPENDITURE (REPUBLIC)

	Vote R	Expenditure R
Salaries, etc.	25 152 000	24 508 355,38
Subsistence and transport	3 034 000	2 901 486,50
Postal services	286 000	352 994,27
Printing	565 000	668 302,06
Miscellaneous	458 000	362 876,22
Plant protection	101 000	56 241,67
Animal and Dairy Science	494 000	393 975,29
Tobacco	51 000	45 813,03
Soil	97 000	59 069,21

(c) EXPENDITURE (REPUBLIC) (Continue)

	Vote	Expenditure
	R	R
Horticulture	37 000	33 214,45
Citrus and Subtropical Fruit	141 000	111 713,19
Fruit and Fruit Technology	134 000	86 336,94
Botany	57 000	55 745,98
Oenology and Viticulture	62 000	58 692,22
Veterinary	752 000	729 514,21
Veterinary Field Services	850 000	961 283,20
Plant Pest Control	94 000	385 628,53
Agricultural Information	108 000	76 993,94
Agricultural Engineering	1 389 000	1 301 428,47
Seed Control	21 000	11 152,03
Regions	829 000	646 128,85
Soil Conservation	17 240 000	14 057 542,95
Agricultural Research Stations	495 000	409 975,74
Agricultural Scholarships etc.	465 500	432 638,11
Minor works	250 000	220 836,74
TOTAL EXPENDITURE	53 162 500	48 927 939,18

(d) EXPENDITURE (SOUTH WEST AFRICA)

	Vote	Expenditure
	R	R
Salaries and allowances	1 620 000	1 375 656,09
Subsistence and transport	710 000	544 349,99
Postal services, etc.	26 000	11 587,45
Printing	16 000	7 208,67
Miscellaneous	17 000	14 091,70
Agriculture	35 000	107 684,98
Veterinary	590 000	389 012,93
Soil conservation	3 644 000	2 594 442,04
Agricultural experiment farms	199 000	143 179,71
Minor works	15 000	3 199,81
TOTAL EXPENDITURE	6 872 000	5 190 413,37

(3) BUILDINGS

(a) Major constructions completed

Pretoria: Brummeria Herbarium	R805 344
Kemptonpark: Jan Smuts Airport Quarantine Station	R863 000

(b) Major constructions in hand

Irene: Administration Building at the Animal Husbandry and Dairying Research Institute	R1 050 000

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VENTER, C.J.S. & FARINA, M.P.W., July 1972. Little boron can do wonders. A
July 1972. Dial a disc for higher crop yields
July 1972. Maize hybrids for Natal
July 1972. S.A.R. battles to move huge maize crop

Crops and Pastures

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Dec. 1972. Fire-proof cotton

Nov. 1972. Silos will handle 200 tons of grain per hour

Dec. 1972. Compaction of soil reduces wheat yields

Economics

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Editorial

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Aug. 1972. Our new Ministry

Sept. 1972. Plough on the farm, The

Sept. 1972. Warning against sheep scab

Oct. 1972. More favourable wool prices

Oct. 1972. Seed trade with E.E.C.

Nov. 1972. Wheat surplus, The

Dec. 1972. Silent revolution, The

Jan. 1973. Milking machines and labour

Febr. 1973. S.A. export and the E.E.C.

March 1973. 47 Years of service to the farmer

Engineering

DIV. OF AGRICULTURAL ENGINEERING; Official test reports on;

Jan. 1973. Milking machines

Feb. 1973. Orange picker on the way

Aug. 1972. Drying and storing agricultural products on the farm

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July 1972. Pernicious scale

Nov. 1972. Higher yield for fruit juice

Dec. 1972. Wine supplement

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Irrigation

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GERTENBACH, J.J., March 1973. Farmers, maintain your contoured lands

PIETERSE, J.P., March 1973. Salinisation of costly irrigation land

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RETIEF, J.C.R., Oct. 1972. Market with a difference, A
SCHUTTE, P.A., & BOSMAN, P.P., July 1972. Enzootic abortions: What farmers can do
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Nov. 1972. Use just enough sunflower in feed

Marketing

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PARSONS, Febr. 1973. Ethical code for consultants
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SCHOEMAN, H., Dec. 1972. Christmas and New Year message.
Sept. 1972. "Farming in S.A." ceases publication
Febr. 1973. Minister's decision on Third Agricultural Report
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LE ROUX, M.S., Dec. 1972. From humble beginnings to the world market
VAN DER MERWE, R., Dec. 1972. Groot Constantia – the cradle of S.A. wines
VAN DER MERWE, R., Dec. 1972. Toast to our wines
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ZEEMAN, A.S., Dec. 1972. Trellising wine grapes
Dec. 1972. Farmers – control downy mildew in good time
Dec. 1972. Grafted vines not required in new areas
Dec. 1972. What we will be drinking from next year

WOMAN AND HER HOME

Fashion

LATEGAN, E., Sept. 1972. Why do we wear clothes?
LATEGAN, E., Sept. 1972. Use colour to your advantage
LATEGAN, E., Oct. 1972. Texture can also be flattering
LATEGAN, E., Oct. 1972. Something for every occasion
LATEGAN, E., Oct. 1972. Clothes must suit the occasion
LATEGAN, E., Sept. 1972. Lines can make or break you
MARTIN, A., Nov. 1972. Accessories enhance but never dominate
MARTIN, A., Nov. 1972. We talk about hats and shoes
Aug. 1972. Wool Board prize winner
Dec. 1972. For festive nights

Hearth and Home

DE JAGER, E., March 1973. Not only your own candles, but also their holders
DE VILLIERS, R., Febr. 1973. Textile block printing
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DU TOIT, C., July 1972. Which type of wood?
DU TOIT, C., July 1972. Why wood is finished off
DU TOIT, C., July 1972. Care of wood, The
DU TOIT, C., Aug. 1972. Wooden furniture (4) – restoring
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HOFMEYR, M., Sept. 1972. Should a family rent, buy or build?
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LATEGAN, E., Jan. 1973. Wash up in a jiffy
NEETHLING, J., Aug. 1972. Saving is an art easily learnt
NEETHLING, J., Aug. 1972. Keep cool when you buy, housewife!
NöFFKE, H., March 1973. Lap meals in comfort
SPIES, S.C.M., Sept. 1972. Flower arranging – a few basic rules

SWART, E., March 1973. My kitchen will have a new floor
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WOEST, H., Sept. 1972. Atmosphere and table decoration
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Sept. 1972. How to fold napkins
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VAN HOEPEN, B., July 1972. Are we committing suicide?
VAN HOEPEN, Aug. 1972. Beautiful things, The
VAN HOEPEN, B., Dec. 1972. Chasing after rainbows
VAN HOEPEN, B., Dec. 1972. We ought to be ashamed of ourselves

Recipes

DE JAGER, E., Dec. 1972. Let's raise our glasses
HATTINGH, E.G., March 1973. Baking gingerbread is an art
JORDAAN, C., Dec. 1972. It's litchi season again
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KöNIG, H., Oct. 1972. Pitfalls and problems of catering
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LATEGAN, E., Oct. 1972. Facts about dried fruit
LATEGAN, E., Dec. 1972. Fruitcake for the festive season
LATEGAN, E., Dec. 1972. Mangoes
LOMBARD, S.H., July 1972. Cheese-making at home
SMITH, F., July 1972. What do the Japanese eat?
SMITH, F., Aug. 1972. Entertaining the Japanese way
SWART, E., March 1973. Samosas – an Indian delicacy
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(7) NEW LEGISLATION

The following Acts were approved by Parliament during the year ending 30 June, 1973:

3/1973 – The Agricultural Pests Act, 1973
9/1973 – Animal Diseases and Parasites Amendment Act, 1973
10/1973 – Livestock Brands Amendment Act, 1973.